MODEL AIRPLANE NEWS

AUGUST 1943 • 20 CENTS

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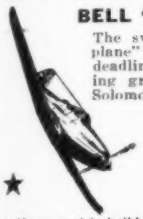

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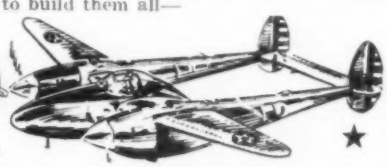

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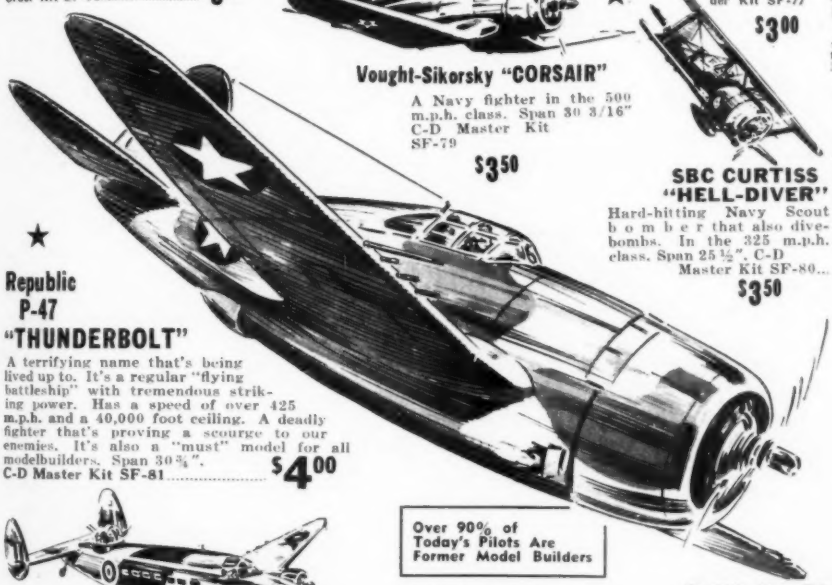

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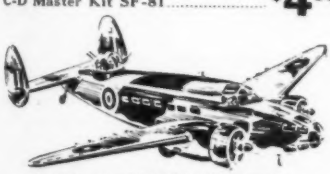

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AUGUST, 1943 VOL. XXIX, No. 2

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Managing Editor, G. C. Johnson; **Associate Editors:** C. H. Grant, R. McLarren, H. E. Burns; **Advertising Manager,** J. P. Cleveland, **Asst. Advertising Manager,** A. M. Hoffman; **Production Manager,** J. M. Mann.

AN AIR AGE INC. PUBLICATION

Published monthly by Air Age, Inc., Mount Morris, Illinois. Editorial and advertising offices: 551 Fifth Ave., New York, N. Y. George C. Johnson, President. Entered as second class matter Dec. 6, 1934 at the post office at Mount Morris, Ill., under the act of March 3, 1879. Additional entry at New York, N. Y. Price 20c per copy. Subscriptions $2 per year in the United States and possessions; also Canada, Cuba, Mexico, Panama and South America. All other countries $2.50 per year.
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THE long-awaited, pre-invasion, round-the-clock bombardment of Fortress Europe has begun. The thousand-plane raids last fall were but experiments, now the real test has begun. And that test is to prove that Germany can be *bombed* out of the war *this year!* Two men claim they can do it, with one proviso, and two others have assured them they will watch the experiment with interest. The first two are Air Marshal Chief Sir Arthur Travers Harris, Chief of the Bomber Command, Royal Air Force and Major General Ira Clarence Baker, Commanding Officer, Eighth Air Force, United States Army Air Forces. The latter two are Prime Minister Winston Churchill and President Franklin D. Roosevelt. The proviso: that nothing whatsoever be allowed to reduce the forces (men and machines) recently allocated to the task of destroying Germany from the air!

Just how many tons of bombs it will take to render Adolf Hitler's Europe untenable is a moot question but some index to the damage already done may be gained by the following figures. In 1942 a total of 37,000 tons of bombs was dropped on Germany. In February, March and April of this year, an average of 10,000 tons was dropped each month. And the last week in May saw a total of 6,500 tons dropped on Essen, Wuppertal, Dortmund and Düsseldorf. In a single raid 2,000 tons were unleashed on the vital industrial city of Dortmund in the Ruhr. Although released figures do not quite make up such a total, Harris has announced that the first 100,000 tons of bombs have fallen on Germany, the second 100,000 tons are now on their way, this time more accurately placed and much larger bombs. Bombing technique now used by the R.A.F.-A.A.F. differs widely from that formerly employed in warfare. Instead of attempting to do considerable damage to a wide area, even a whole nation, picked cities receive thousands of tons of bombs in one (or at most, two) raids, completely annihilating the city, its establishments and its population. The old arguments about civilian bombings are now over-shadowed by military necessity and the only solution to the problem consists in simply warning the European population to leave the areas in and around military targets such as seaports and harbors, ammunition and supply dumps at railheads, factories engaged in production of war machinery and industrial districts producing the raw materials of warfare. Unfortunately this involves practically the whole of Europe but most particularly the Ruhr Valley and coastal ports. That this war might end this year is a breath-taking thought but all military leaders must assume it will not, must assume that it will take a great deal longer and so be prepared for a prolongation should it become necessary. General Billy Mitchell had a theory nearly twenty years ago. You and I may soon know whether or not he was right!

Noteworthy has been the whacking big total of enemy fighters brought down by our Fortress and Liberator bombers over Europe. Smashing the old myth about bombers being bombers, fighters being fighters, and never the twain shall meet, the powerful armed (8 machine-guns on flexible mounts in the B-17) bombers are taking a deadly toll of Luftwaffe fighters and one Fortress recently claimed 13 fighters downed in a single raid. Latest report: between August 17th, 1942, and May 22, 1943, American bombers shot down a total of 923 German fighters! Such a toll of enemy fighter strength is damaging, but greatest toll has been in enemy pilot morale, who now frequently shun the Fortress completely or keep cautiously out of range when attacking them with long-range shell guns. Stories have been circulated that a Fortress recently bagged two Luftwaffe Focke-Wulfs with cannon fire! Arming the waist-gunners of the Fortress with 20 mm. cannon might make of them such formidable weapons as to preclude damage by enemy fighters!

The Aberdeen (Md.) Proving Ground has developed a super-explosive that has *doubled* the effectiveness of aircraft bombs, it was recently announced by Maj. Gen. C. T. Harris, Jr., commander of the famed research and testing establishment. Already in use for many months in Europe, the super-powder contains a sugary-white substance known as hexamethylenetetramine! Known more briefly as hexamine, the chemical has been used for many years in pharmacy prescriptions, but not until last year was its more deadly possibilities discovered.

The "Gibson Girl" is now saving lives at sea. Bendix Aviation has announced that it is supplying an emergency radio transmitter to the armed forces for use of pilots downed at sea or in inaccessible regions. The Gibson Girl, so named because of its hour-glass shape, broadcasts an automatic S-O-S on the pre-tuned international distress frequency of 500 kilocycles over an area of 100,000 sq. mi. which, in addition, may be used as a directional indication of the crew's location. The Gibson Girl is tossed overboard in distress, parachuting to the water or land. It is retrieved by the crew upon landing and by simply turning a small crank which serves as a generator, the apparatus begins its life-saving work.

Howard Hughes was injured recently in a crash which took the life of one man and severely injured three others. Hughes, in company with William M. Cline, a Civil Aeronautics Inspector; Glenn E. Oderick, assistant to the president of Hughes Aircraft; Charles von Rosenberg, co-pilot; Gene Blandford, engineer, and Richard Felt, flight mechanic, took off from Glendale, Cal., in Hughes' big Sikorsky S-43 amphibian for a flight to Lake Mead behind

(Continued on page 46)

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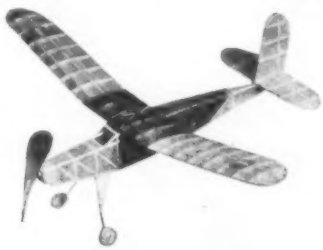

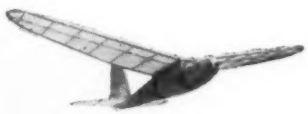

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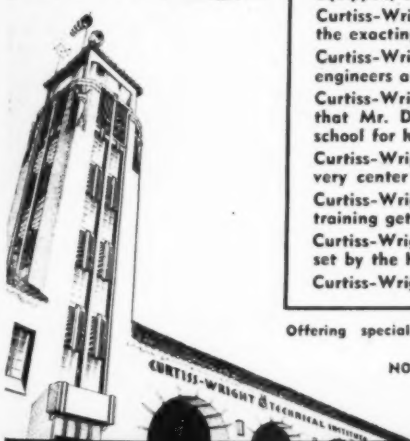

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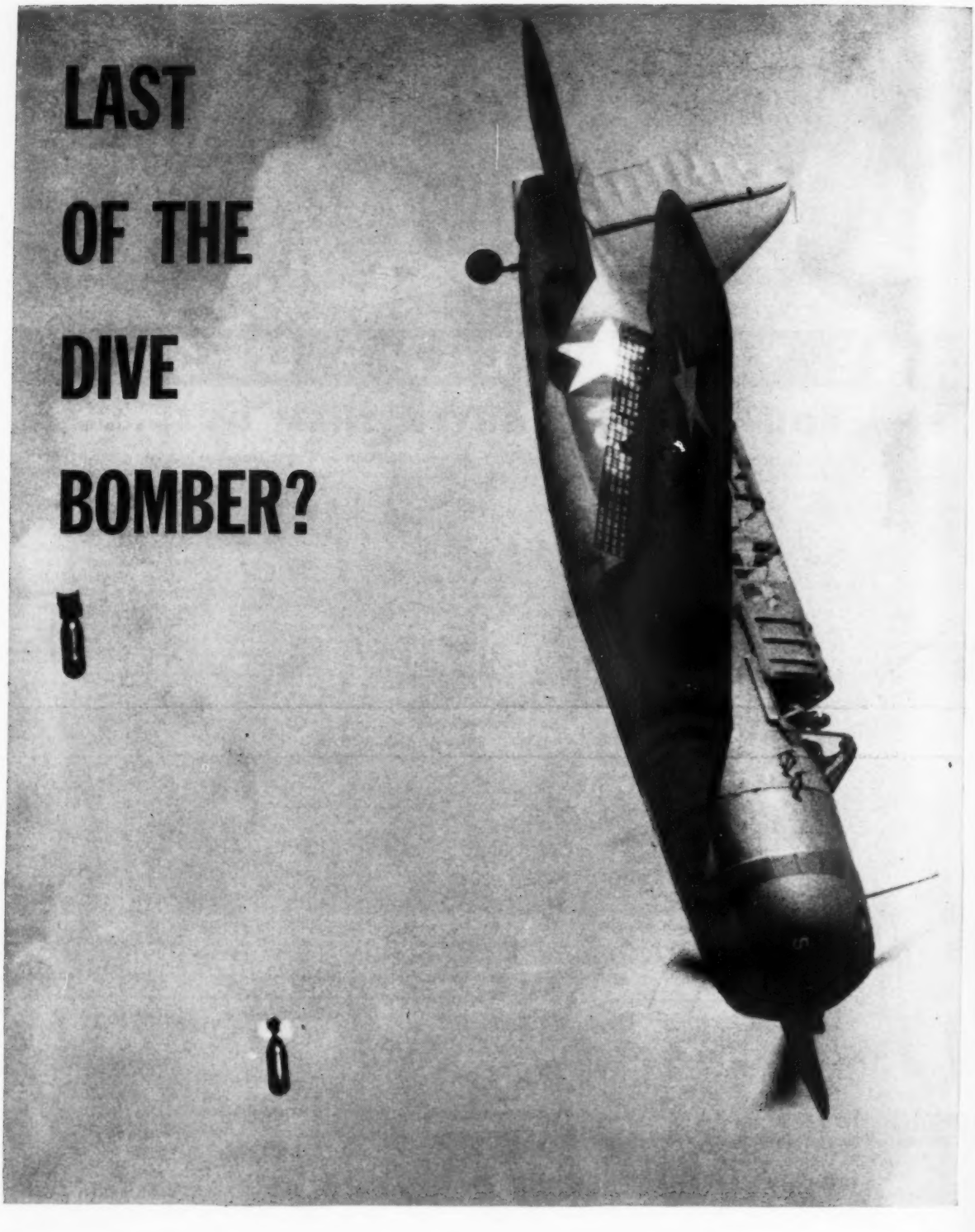
LAST OF THE DIVE BOMBER?



The controversial subject of dive bombing is presented here from one viewpoint with which you may or may not agree.

by **ROBERT McLARREN**

THE near-irresistible tide of German victory, as the Wermacht plunged the dagger of treacherous assault into the breast of nation after nation during the first three years of this World War II, followed a strangely uniform pattern. The cycle of Hitler's attack upon successive European peoples consisted of three major military phases: (1) the sudden, sky-darkening, death-dealing onslaught of dive bombers, (2) the powerful juggernaut of mechanized Panzer divisions, and (3) the final mopping-up operations of infantary troops. In the vanguard was always the dreaded Junkers Ju-87b Stuka dive bomber, whose villainous assaults laid waste mile-after-mile of cities and fields, soldiers and civilians alike.

Poland was massacred in a matter of days by the Stuka. The Lowlands were reduced to shambles by this black-snouted terror and the mighty Maginot Line, pride of the French Army, collapsed under the dive bomber's incessant pounding. Greece was overpowered by this aerial weapon and, for a time, the length of the African Mediterranean Coast lay prone before its headlong plunge.

And yet the Stuka remains a paradox of modern war. A close examination of the plane reveals a design judged obsolescent at the outbreak of the war on September 3rd, 1939. It was ungainly in appearance (fixed landing gear, multihedralled wing, high sway-back enclosure), performed poorly (top speed: 210 mph.), was unwieldy in combat (maximum rate-of-climb 1,600 ft. per minute) and had a range of only 1.8 hours (370 miles). What, then, accounts for its horrible success?

Effectiveness is normally only a comparative term and the fact that the Stuka was "effective" means, simply, that it overcame the ground resistance offered, which in the great majority of cases, was nil. The Stuka was never intended to be an aerial fighter, and was always protected, when necessary, by swarms of Messerschmitt Me-109 and Me-110 fighters provided for the purpose. And the fighter protection was only required intermittently against the Central European nations and only for a time against France prior to the collapse of the French Air Force.

But when the Stuka met the Royal Air Force over the blood-drenched beaches at Dunkirque, it was stopped cold; for its fighter convoy was shattered by Spitfires, Hurricanes and the briefly famous Boulton-Paul Defiant. In the Battle of Britain, Stukas rained down from the skies like so much matchwood and were quickly withdrawn.

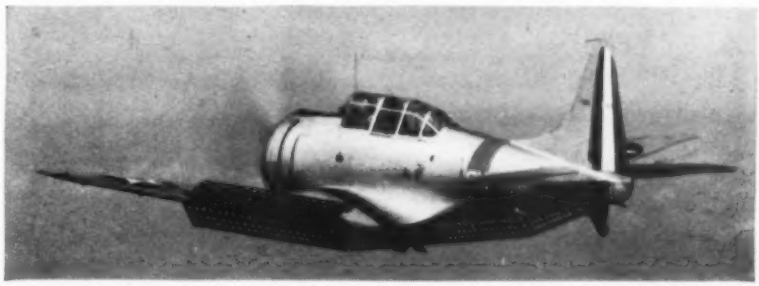
But Reichsmarshall Goering ordered continued production of the Junkers and with it Fieldmarshall Rommel battered his way to the very gates of Egypt. But the R.A.F. wasn't on hand because of difficulties of delivery, supply and maintenance.

When General Sir Bernard Law Montgomery began his attack upon Rommel, armed with Hurricane and Spitfire desert fighters, the Stuka was smashed and the greatest military chase in all history began. As the enemy raced through

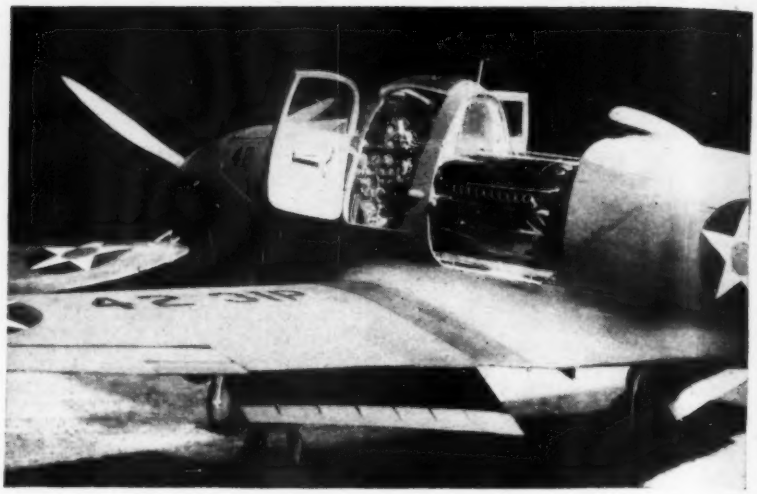
(Continued on page 43)

Opposite. **In this remarkable action photo a Brewster Buccaneer is racing its own bombs before pullout.** *Above.* **Note the cleanness of design of the Vultee A-31 compared with the Stuka. A 1600 hp. Wright Double Cyclone takes this Vengeance aloft.**

Fourteen years of Curtiss-Navy collaboration went into this A-25, Army version. It is a two-place, midwing monoplane powered with a 1700 hp. Wright Cyclone that whirls a Curtiss electric prop



The Douglas Dauntless, nemesis of the Japs at Tulagi and the Coral Sea, is shown with extended air brakes. *Below.* **This captured Ju. 87 Stuka of a squadron of 17 completely put out of action by Allied airmen**



BUILDING SCALE MODEL PLANES

An expert tells how he builds detail scale model airplanes and gives helpful suggestions to other modelers

by JON W. HAUSER

WE DO not intend trying to tell any scale model builder how to build good prize-winning models, but shall only tell how our models were built and perhaps the method for being fairly certain of a prize in contests.

The first model built, of the three pictured, was the Grumman F3F2. This was revamped from a commercial model kit, requiring many hours of careful research and re-drawing of details.

About the time of building scale models were few and far between and contests for the event were practically zero. This, we believe, was due to the stumbling block of duplicating the aluminum finish and rivets contained in most modern planes. We admit that only after considerable delay in the fuselage construction did we overcome the trouble. One day while rummaging through a drawer of paper stock, we discovered some paper-backed silver foil—the answer to a prayer. By laying out the paper in the form of actual skin on the fuselage and then pressing the rivets through from the back side of the paper all the rivets necessary for the plane were simulated. This requires a lot of time, but the results are well worth the trouble. There are about 3000 rivets in the model.

The plane's motor is also revamped to meet Navy requirements. One of the main alterations was the change in the reduction gear drive cover from a direct drive to an 8:5 ratio. Roughly, there are about 850 pieces in this motor; construction required the better part of 4-1/2 months.

The bolts and nuts were filed to a hexagon shape from ordinary straight pins and each cylinder flange cut from heavy paper and sanded to final shape.

The landing gear was the first retractable one we had attempted, and those who have built this ship have some idea of the precise work required to get the multiple arms to do the right thing at the right time without binding.

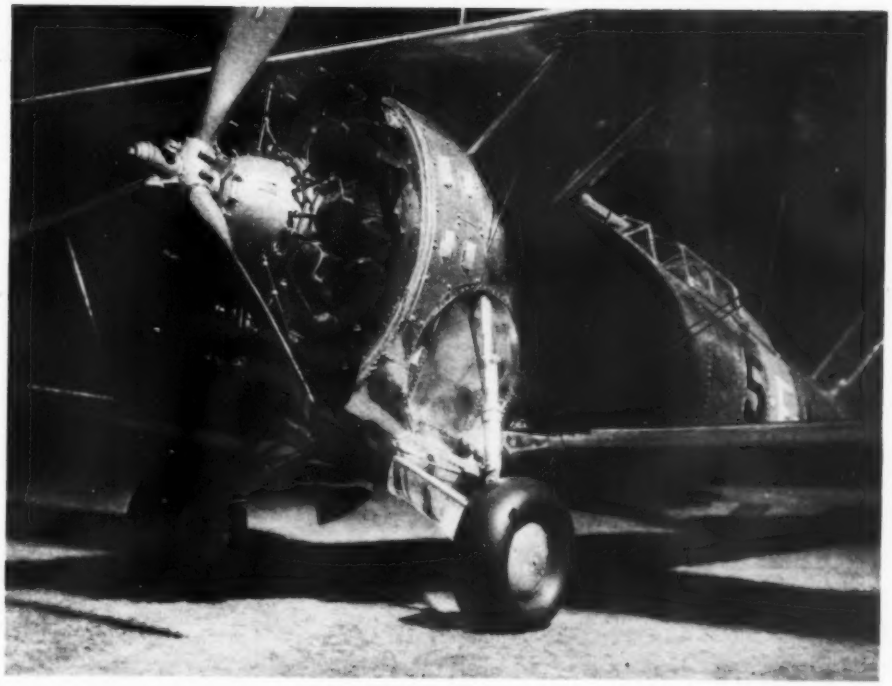
The fuselage is monocoque constructed with the aforementioned silver-foil paper-backed paper. Wings are built up with usual spars and ribs. Cockpit is complete in every detail even to the scraped marks on the floor and rudder pedals from the pilot's feet.

The model won first place, which was the Clyde Lucas Trophy, at the Hotel Statler in Detroit; it has been entered in no other contests. However, in this contest it received 62-1/2 out of 65 possible points. So much for the Grumman.

Next, the Seversky P-35. This model was also adapted from a commercial kit, but required even more research than the other. No details could be had at the time and so after several visits to the local Army Airport, we were able to detail the model.

The motor is a 14 cylinder Pratt and Whitney twin row Wasp, with about 1700 parts in it. It was built in the same general way as the Grumman motor. We learned a lot from the Wright motor and

(Continued on page 41)



Page 8. Top Left Grand Champion Trophy Winner 1942, Bell P-39 with its builder, Jon Hauser. *Top Right* Closeup of cockpit, engine and flap details. *Bottom Left* A Seversky P-35 winner of Hotel Statler Trophy 1941. *Bottom Right* Bell P-39 showing landing gear and external detail. *Page 9. Top* Grumman F3F2 that won Clyde Lucas Trophy in 1940, a marvel of workmanship. *Right* Engine, landing gear and rivet details are staggering. *Below Left* Display of three champion models. *Below Right* Jon Hauser puts finishing touches to the Bell P-39 in his shop.

PROPELLER REACTIONS

The aerodynamic effect of propeller slipstream and torque

by **GEO. H. TWENEY**

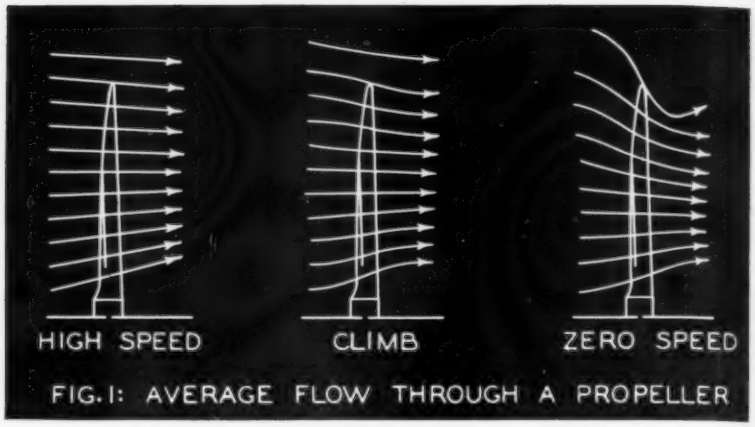


FIG. 1: AVERAGE FLOW THROUGH A PROPELLER

THE aerodynamic theory of the propeller is in many respects similar to wing theory. The same wing section theory applies to airfoils and propeller sections. Just as the airfoil provides its lift by deflecting the air downwards, so the propeller produces thrust by forcing the air backwards. Both theories follow the same logical lines and the comparison is so perfect that in extreme cases the same mathematical equations may be applied.

The resultant stream of air which flows from the propeller over the fuselage, tail surfaces and other parts of the airplane, is called the "slipstream."

The extent of the slipstream may be taken roughly as being that of a cylinder of same diameter as the propeller. Actually, there is a slight contraction of the slipstream directly behind the propeller, but we will discuss that in a few minutes. The theoretical consideration is that the air follows through the propeller disc without any change in size of column of air which is affected by the propeller.

Slipstream velocity is always greater than that at which the airplane is travelling through the air. This is a very important statement and one which few model builders ever consider. The increase in velocity may be as much as 100%, or even more, especially at the stalling speed of the airplane. This means the velocity of air flowing over all those airplane parts in the slipstream is twice that of the airflow over the other parts, and hence the drag is four times as great as corresponding parts outside the slipstream (since the drag of any body varies as the square of the velocity). At higher plane speeds the difference is not so great, only about 50% at normal speeds, and as low as 10% at high speeds.

In addition to this increased velocity the propeller will impart a rotary motion to the slipstream in the same direction as its own rotation. The result is the slipstream will strike only one side of such surfaces as the vertical tail, thus it may have considerable effect on the airplane's directional and lateral balance. If these effects are compensated for in normal flight by some method such as offsetting the vertical fin so that it does not lie directly fore and aft, then balance will be upset when the propeller stops rotating and the slipstream ceases to exert its influence.

The diameter of the column of air displaced by the propeller is not the same as the propeller diameter itself, as we mentioned earlier. The diameter of this column, according to Bernoulli's Equation, will vary with the velocity; so the greater the velocity the smaller is the crossectional area, and consequently the diameter of the column. (For a discussion of Bernoulli's Equation, see footnote.)

Figure 1 shows the lines of average flow in a longitudinal section of the slipstream of a propeller for three different forward velocities. It will be noted the diameter of the slipstream changes more at lower velocities where the thrust, and therefore, the additional velocity, is greater.

Slipstream increases the parasite drag of the objects in its path, but it can be calculated that for large speeds, this is a noticeable fraction of the original resistance. At low speeds the effect is not too important; whether or not it is important on a gas model may be questionable.

Another disadvantage of the slipstream is that it absorbs energy and therefore increases amount of power required for flying. Since gas models are well overpowered anyway, it is doubtful if this advantage really amounts to anything.

Its biggest advantage is that at low speeds it can be used to obtain suitable control and stability by its effect on tail surfaces. In large airplanes this is particularly advantageous when taxiing on the ground.

It has already been mentioned that propeller torque will tend to rotate the complete airplane in the opposite direction to the propeller rotation. Where very high-powered engines are used in small airplanes, as for example a gas model, this effect becomes very appreciable and must be counteracted in the design. The rotational effect of the slipstream forms a part of this effect, and must be considered in any remedy which we might apply.

The most usual method of correction is to put "washout" into the wing, or gradually decrease the angle of incidence towards the wing tip of the wing which tends to rise. This wash-out is often accompanied by a corresponding "wash-in," or increase of incidence on the opposite wing.

Other methods of counteracting propeller torque may sometimes be employed, such as an unequal distribution of wing area or weight about the plane's longitudinal axis.

By any of the above methods of correction for torque there is bound to be a corresponding upset of balance when the propeller is stopped, and torque is eliminated.

Model builders are now using a method called the "side thrust control" for torque. In this method the thrust force is set at an angle so as to produce a turning tendency causing the torque wing to travel faster. The increased velocity of this wing increases the lift of the wing, and so counteracts the torque. While the model is under this side thrust influence it is really in a skidding turn, and unless the side area of the model is properly proportioned the model may become unstable.

The rudder may also be used to produce this effect, but the result is not as pronounced as when the thrust is used. The rudder effect depends on the model's power and propeller, and also on the speed. It is small on rubber powered models, but rather large on gas models.

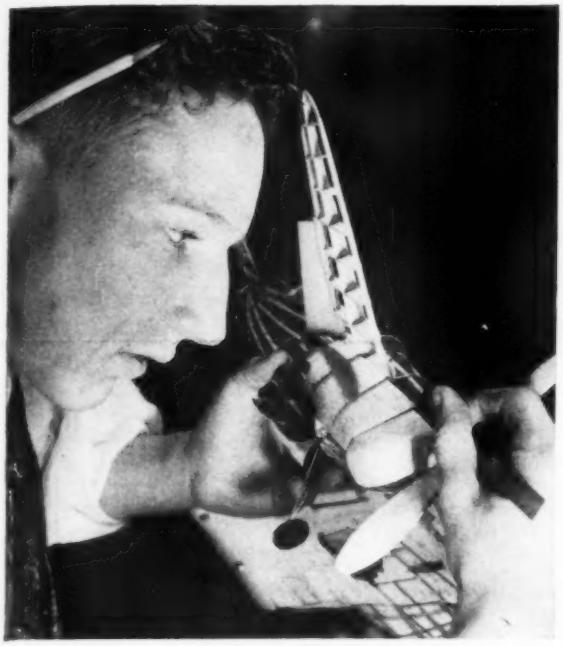
In summarizing, the logical solution to the torque problem is use a small amount of each type of correction. It is probably best to allow the model to turn with the torque, so that when the power is all run out the model will turn in the opposite direction with no upsetting tendencies.

Some builders prefer to make their models turn against the torque. In this case the circle is clockwise instead of counter-clockwise, and the model tends to bank with the right wing down. Propeller torque, however, tends to turn the ship in the opposite direction, and the two forces can be made to balance each other. By turning against the torque the model can describe a circle of more constant radius than by turning with torque, which is a variable quantity.

VICTORY

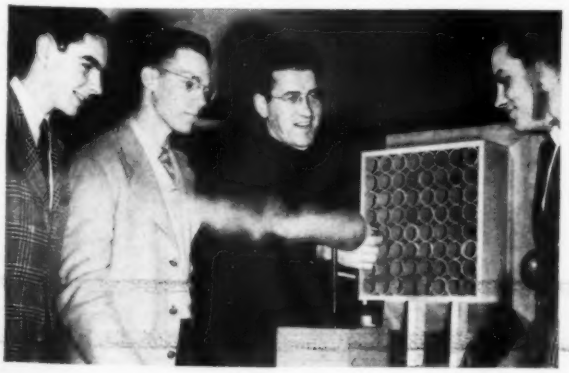
AMERICAN EAGLETS

Young men are preparing for and aiding America's war in the air



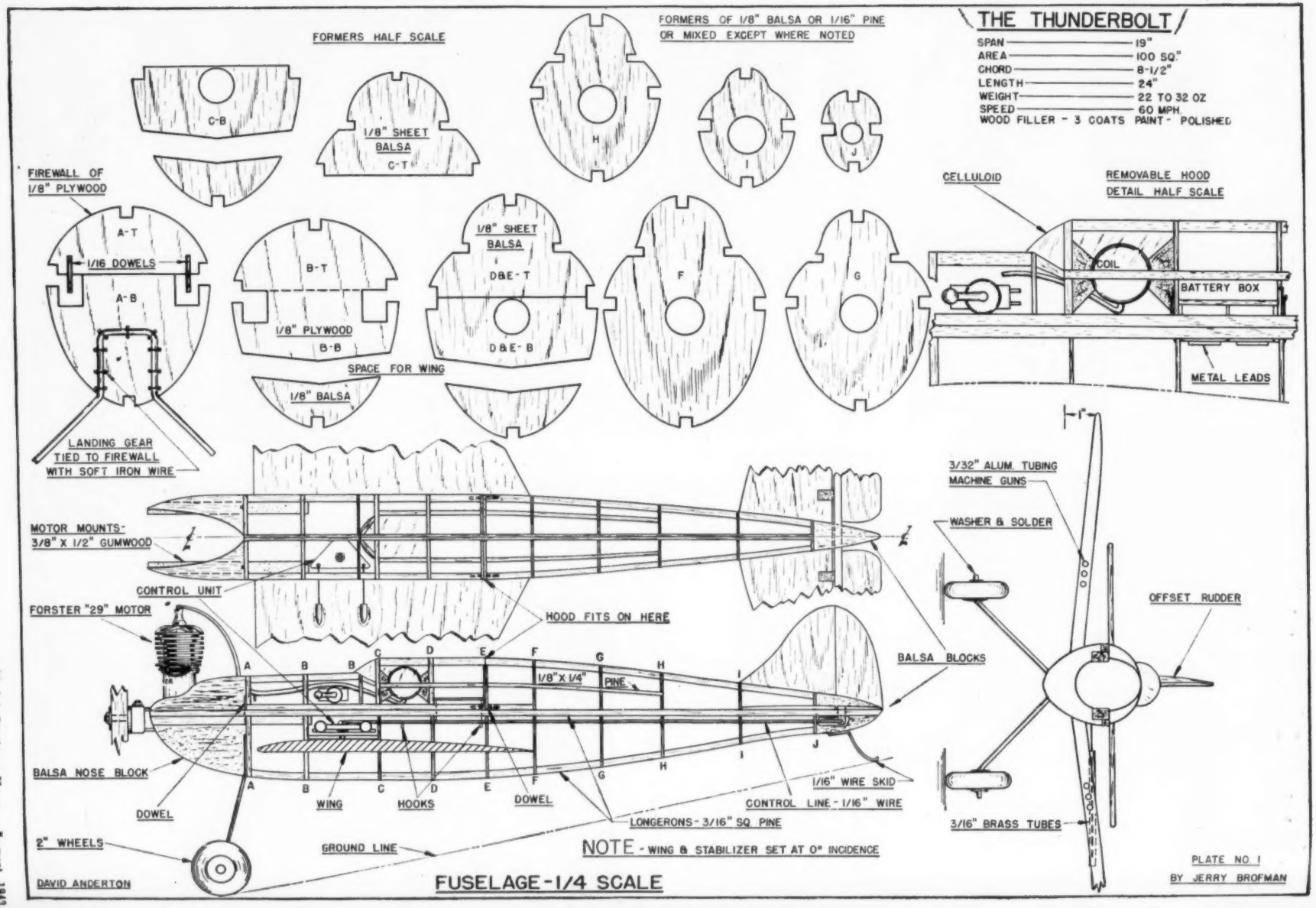
Brooklyn (N.Y.) Preparatory School is one of the many schools which has adopted a program of pre-flight aeronautics instruction—the photographs on this page show the training activities in some of these classes. *Above* A young man gains a sense of accuracy by checking measurements on a model he is constructing

Above Rev. Wm. C. Perry, S.J., head of the Physics Department, watches intently while two students repair and assemble a gas powered plane. *Below* Students learn something about airflow around a streamlined object which is shown facing a home-made wind tunnel



In Britain, a similar pre-flight training course for boys is estimated to have cut six to eight months from the time needed to train RAF men. *Above* An instructor points out some interesting aerodynamic features in a class of scalemodel building (International News Photos)

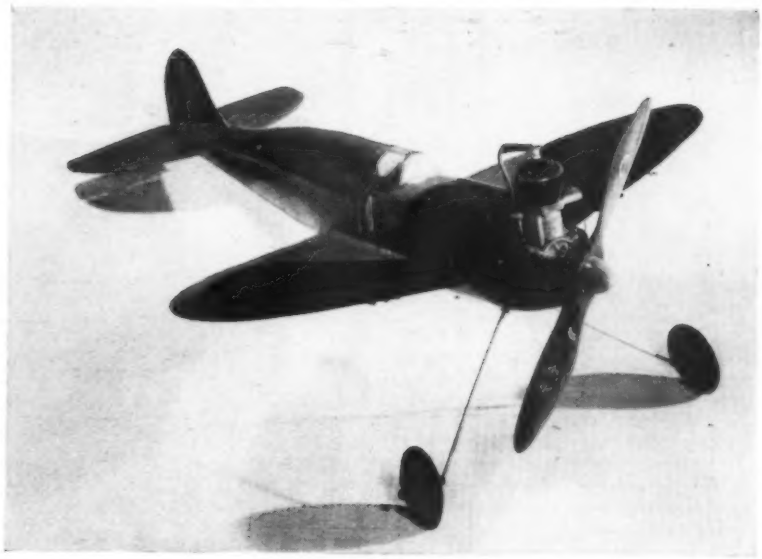
Above Students "get the feel" of controls and learn how to operate them. *Below* A class of junior students displays some of the identification models they have constructed. . . . All are gaining invaluable knowledge to use in our new Air Age


THE THUNDERBOLT
SPAN 19"
AREA 100 SQ"
CHORD 8-1/2"
LENGTH 24"
WEIGHT 22 TO 32 OZ
SPEED 60 MPH.
WOOD FILLER - 3 COATS PAINT - POLISHED
FORMERS HALF SCALE
FORMERS OF 1/8" BALSA OR 1/16" PINE OR MIXED EXCEPT WHERE NOTED
C-B
1/8" SHEET BALSA C-T
H
I
J
FIREWALL OF 1/8" PLYWOOD
A-T
1/16 DOWELS
A-B
B-T
1/8" PLYWOOD B-B
1/8" SHEET BALSA D&E-T
D&E-B
F
G
SPACE FOR WING
1/8" BALSA
LANDING GEAR TIED TO FIREWALL WITH SOFT IRON WIRE
CELLULOID
REMOVABLE HOOD
DETAIL HALF SCALE
COIL
BATTERY BOX
METAL LEADS
MOTOR MOUNTS- 3/8" X 1/2" GUMWOOD
CONTROL UNIT
FORSTER "29" MOTOR
HOOD FITS ON HERE
1/8" X 1/4" PINE
BALSA NOSE BLOCK
DOWEL
WING
HOOKS
DOWEL
LONGERONS - 3/16" SQ PINE
CONTROL LINE - 1/16" WIRE
1/16" WIRE SKID
2" WHEELS
GROUND LINE
NOTE - WING & STABILIZER SET AT 0° INCIDENCE
DAVID ANDERTON
FUSELAGE - 1/4 SCALE
3/32" ALUM. TUBING MACHINE GUNS
WASHER & SOLDER
OFFSET RUDDER
BALSA BLOCKS
3/16" BRASS TUBES
PLATE NO 1
BY JERRY BROFMAN

LEASHED DEMON

How you can build a speedy modern pursuit type U-Control model that is easy to fly

by **JERRY BROFMAN**



DURING past contest seasons—when free-flight gas models were in vogue and gas and cars were plentiful—modelers tried for long, high flights. Few modelers ventured to the field with realistic looking ships, and the contest airplane was getting to look like anything but an airplane. Some said this could not have been helped, and some said it could have been helped. "Dyed in the wool" contest builders criticized fellows who brought to the field anything that resembled a real airplane. They said that their crazy looking contest jobs would win—and usually through luck or logic their crazy looking jobs did win!

Nowadays, with gas, cars, flying fields, motors, balsa (one could go on forever) being scarce, U-Control models are being seen much more frequently; in fact, there are very few free-flight fans left—who would risk losing a motor that cannot be replaced, on a thermal flight without a car to chase. These now popular U-Control ships can be made either to exact scale or semi-scale; at least, they can be made to look like a real airplane without the loss of flight efficiency. They also can be given beautiful paint jobs with many details, such as machine guns, bombs, etc., and can be built strong and streamlined to last very long. There is fun and much knowledge of "hot" flying military jobs gained in controlling these little "speedsters."

Now, to tell you something about our Thunderbolt. She was designed to resemble the average fast pursuit ship of today. Its internal structure reminds one of the Republic P-47 Thunderbolt; it is very compact with a place for everything and everything in its place! There is little room to spare for anything after ignition and controls are in. It also is like the P-47 in that it is slightly heavy for its area, slightly small for its power and "built like a brick" to last.

If you build the Thunderbolt you will not only have a realistic, good looking U-Control model, but one with amazing flying ability, whether you are interested in control or speed.

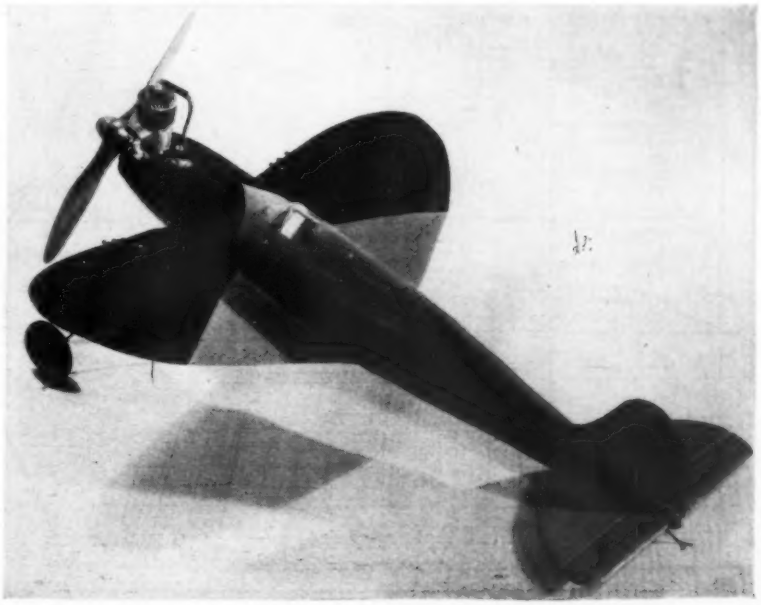
Start by scaling up the plans to full size. Next cut fuselage formers to shape. These are made of 1/8" balsa, 1/16" pine or both. The original ship was made entirely of 1/16" pine formers, except where noted on the plans. Cut the two side longerons of 3/16" square pine to their exact lengths, as shown on the fuselage top view. Do the same for the bottom 3/16" square pine longeron. Then steam and pin it to the side view to get the correct bend. Assemble the fuselage by marking off the places on the three longerons where the formers fit. Insert the two side longerons first and cement them to the formers. Use rubber bands to hold the rear bend in place.

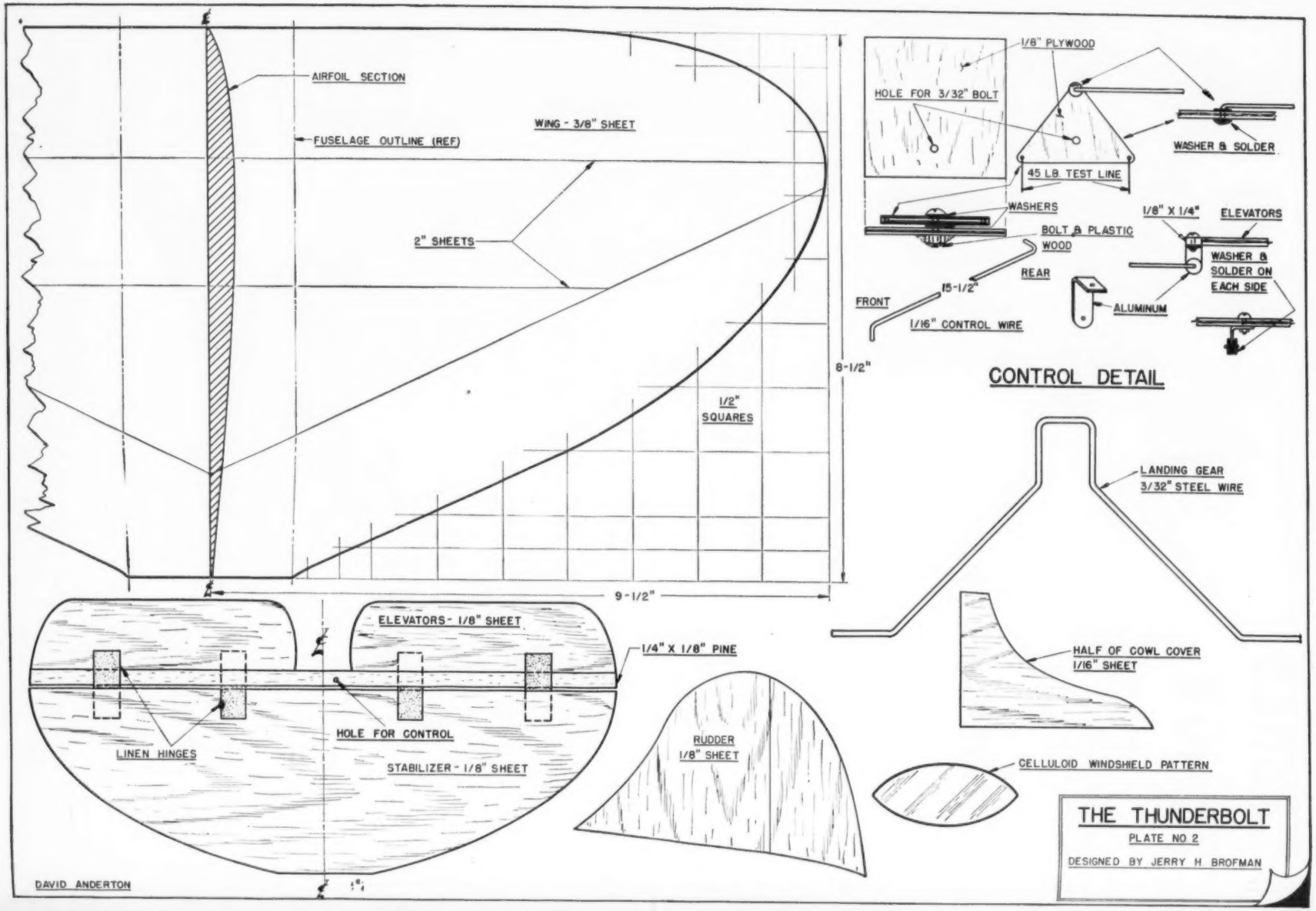
The wing is made next. Cut two wing halves of 3/8" x 2" sheet balsa. If balsa is not available, pine can be used if the center is cut out and 1/16" pine ribs inserted at 1-1/2" intervals. Cut the wing to rough airfoil shape as shown on the plans; finish off by block-sanding as you would a hand-launched glider wing. Join the wing halves with 1" dihedral in each tip—give this joint at least three coats of glue.

When the wing is dry it is cemented to the fuselage. It fits on the bottom of formers B, C, D and E and flat against former F. Cement it very firmly to these formers, as it will take much stress at high speeds and "hot" landings. Cement the bottom of formers B, C, D and E to the bottom of the wing. When dry cement the steamed and bent bottom longeron to the bottom of the fuselage formers. Steam and bend the rear top longerons as you did the bottom one. When dry cement it to the rear top formers from former E to former J.

Front top formers of the removable hood are now cut, and the removable hood is assembled. This hood, as shown on the plans, holds all the ignition, including battery box. This is very accessible. The ignition can be put in now. The battery box is made of sheet balsa and fits between hood formers

The sleek streamlined speedster ready for action




AIRFOIL SECTION
FUSELAGE OUTLINE (REF)
WING - 3/8" SHEET
2" SHEETS
1/2" SQUARES
8-1/2"
9-1/2"
ELEVATORS - 1/8" SHEET
1/4" X 1/8" PINE
HOLE FOR CONTROL
LINEN HINGES
STABILIZER - 1/8" SHEET
DAVID ANDERTON
1/8" PLYWOOD
HOLE FOR 3/32" BOLT
WASHER & SOLDER
45 LB. TEST LINE
WASHERS
1/8" X 1/4"
ELEVATORS
BOLT & PLASTIC WOOD
WASHER & SOLDER ON EACH SIDE
REAR
15-1/2"
FRONT
ALUMINUM
1/16" CONTROL WIRE
CONTROL DETAIL
LANDING GEAR 3/32" STEEL WIRE
HALF OF COWL COVER 1/16" SHEET
RUDDER 1/8" SHEET
CELLULOID WINDSHIELD PATTERN
THE THUNDERBOLT
PLATE NO 2
DESIGNED BY JERRY H. BROFMAN

E and F as shown on Plate 3. The coil is glued between the two balsa blocks, which in turn, are glued between the formers as shown on Plate 3. The batteries come out through the bottom. A switch is used in place of a timer. Cover the hood with 1/16" sheet balsa just as the rest of the body is covered. Cut two motor mounts of 3/8" and 1/2" gum or basswood and insert in the first two formers, which are made of plywood. Cement the mounts in thoroughly, using extra coats of cement to insure strength.

Bend the landing gear of 3/32" steel wire to shape, as shown on Plate 2, and bind it to the firewall with soft iron wire. Coat the firewall with at least three coats of cement to keep the gear on firmly and prevent gas seepage into the fuselage. Carve the nose block (of soft balsa) to shape and cement to the mounts and firewall as shown on plans. Sand and shape to body contour.

Cut the control pieces from 1/8" plywood as shown on Plate 2. Assemble the two control pieces with the 3/32" steel bolt as shown. Bend the control wire of 1/16" steel wire—15-1/2" is the length—but it might vary on different ships. Cement the finished control unit into the bottom fuselage half right over the wing as shown on the fuselage plans.

Cut the elevators, rudder and stabilizer all of 1/8" sheet balsa. The 1/4" x 1/8" pine strip is cemented to the elevators as shown. Linen hinges are used to hold elevators to the stabilizer. Cut and bolt the aluminum control fitting to the 1/8" x 1/4" pine strip. Cement the stabilizer-elevator unit to the fuselage longerons as shown. Attach the control wire to the aluminum control fitting on the elevators as shown on the plans; that is, with washer and solder on each side, allowing the fitting to swing loose around the wire. See that the elevators go up and down about 1/4" in each direction when you pull the control lines. The stabilizer-elevator unit is cemented firmly to the fuselage longerons as shown. The top rear balsa block is cemented to the top of the stabilizer; the bottom block is cemented to bottom of the longerons. The rudder is cemented to the top balsa block. Remember to offset the rudder about 1/4" to the right—against the turn of the circle being flown around.

The 1/8" x 1/4" pine strips should now be inserted from former E to former H. When dry sand the entire fuselage. Cover the fuselage with 1/16" sheet balsa. Use a 3" sheet to cover the bottom from former F. Use 1-1/2" sheets to cover the space on top of the wing from former A to F. Use 3" sheets to cover each quadrant of the rear elliptical crossection from former F to former J on bottom, and from former E to former J on top. Steam the sheet balsa if you find bending it to the fuselage curve is too hard. Be sure to cement the sheets to *each and every* former—use pins liberally. When dry, remove pins and sand smooth. Start with No. 1 sandpaper, and finish with 6/0 sandpaper. Give three coats of thin cement over sheeting and fill in any cracks and seams with wood filler. Sand between each coat. Apply three coats of colored dope. The original was black in front, and orange in the rear, as shown in the pictures.

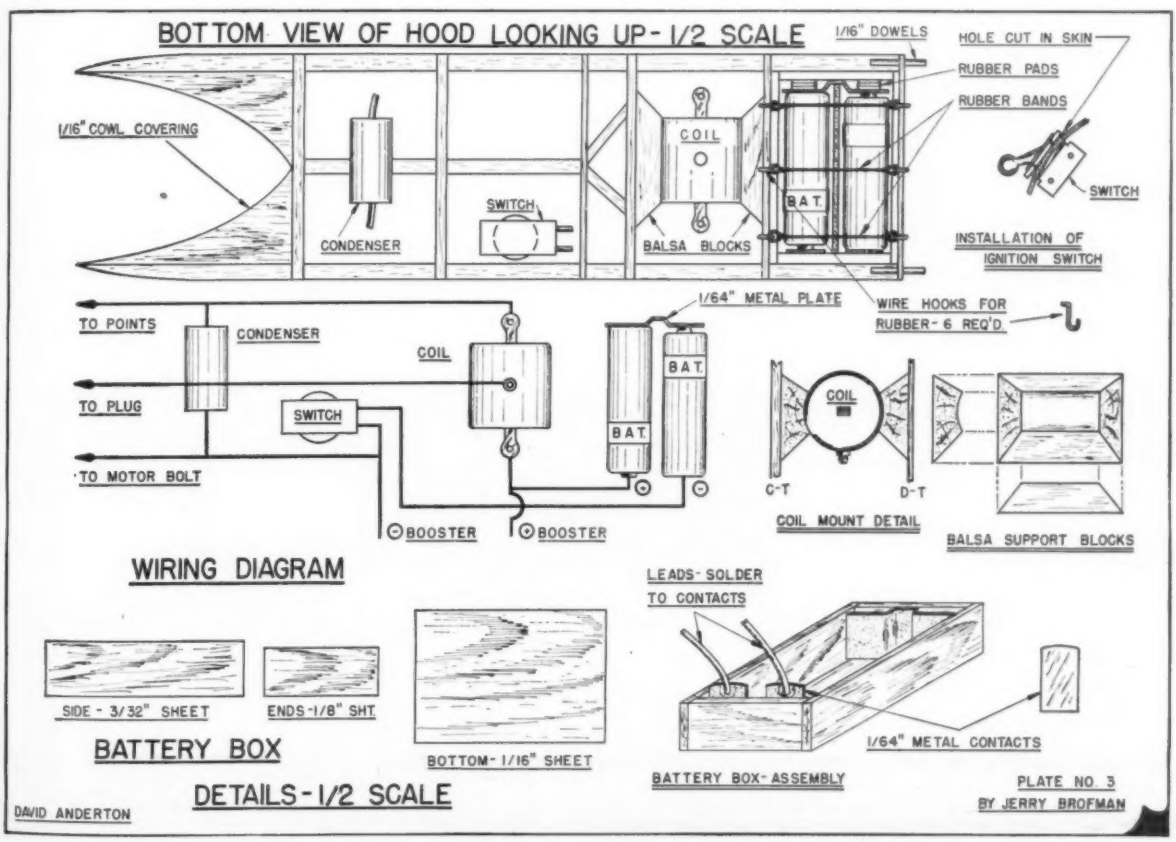
Bolt down motor with about 1/16" right thrust, against the circle flown around. The control lines are of 45 lb. for the Forster "29" or similar class B motor; 60 lb. test should be used for larger Class C motors. The lines go through 3/16" aluminum or brass tubing, set in horizontally in the wing, shown in the top and front views of fuselage in Plate 1.

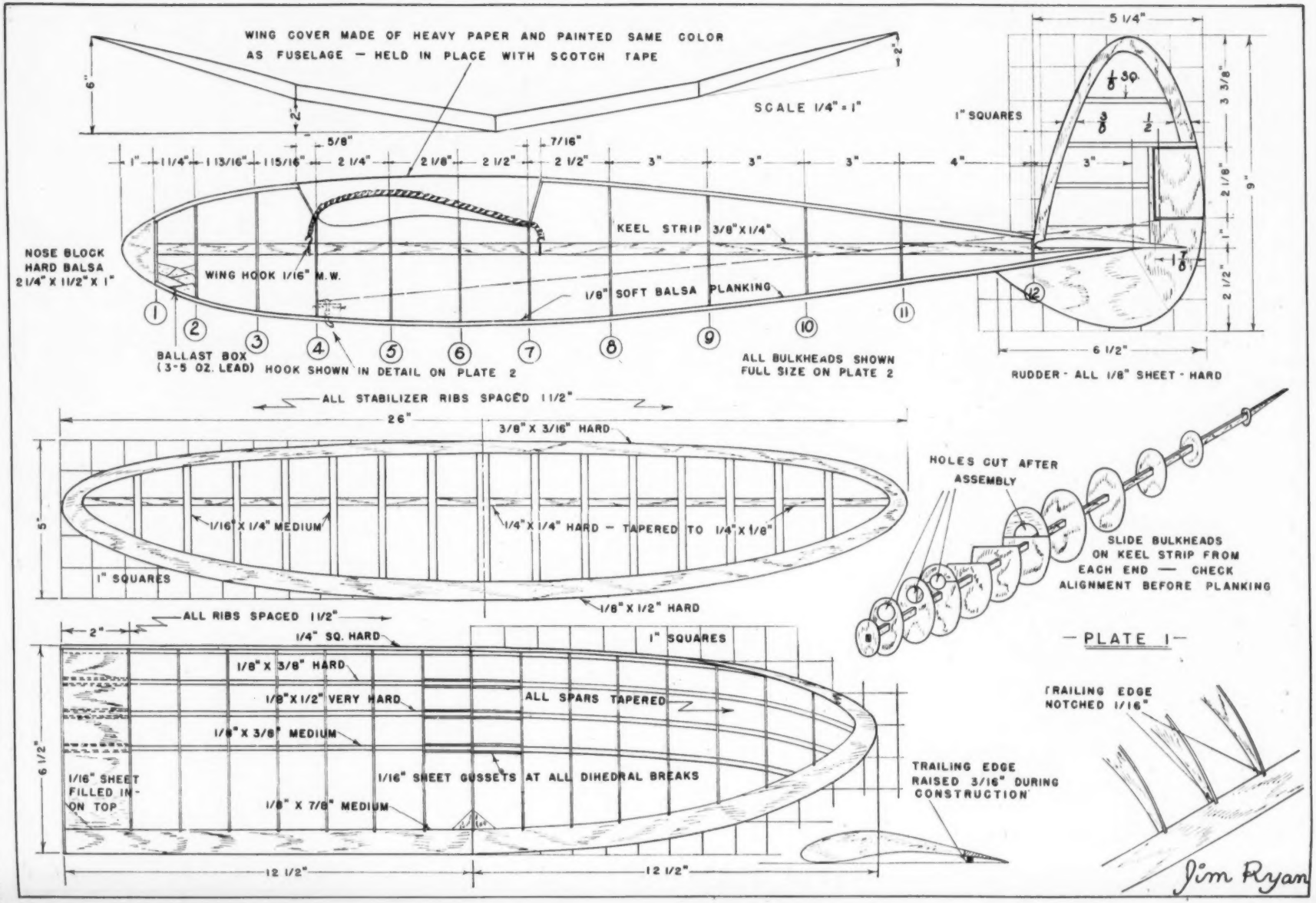
Attach the hood to the fuselage, by inserting the 1/16" dowels in their respective holes in the fuselage. Connect the high tension lead to the plug, the point wire to the points and the ground wire to any one of the motor bolts.

Test the motor before going to the field. Be sure it runs smoothly on your inside batteries. See that the control lines work smoothly. For test flights, it is best to fly in a dead calm. Have your helper get the motor running at about half throttle for the first flight. Let the ship roll and gain speed. Give the up-line a little pull and she will hop into the air. Notice that at neutral control she will fly by herself. She will not go into the circle at you, because of the offset rudder and thrust line. Try the controls for up and down—do not over-control—just a little pull is necessary because of the large "flippers" (elevators). On the next flight, run the motor more if you are sure you understand the controls.

With a little practice, exciting speed and tricks may be performed by pilots of this "Leashed Demon."

VICTORY



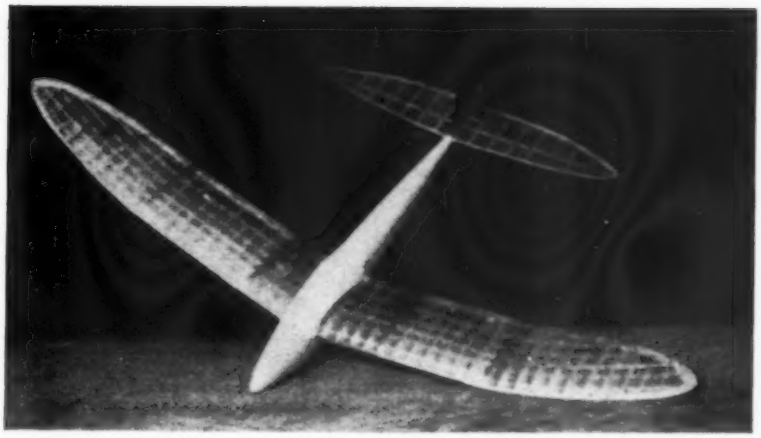

WING COVER MADE OF HEAVY PAPER AND PAINTED SAME COLOR AS FUSELAGE — HELD IN PLACE WITH SCOTCH TAPE
SCALE 1/4" = 1"
NOSE BLOCK HARD BALSA 2 1/4" X 1 1/2" X 1"
WING HOOK 1/16" M.W.
KEEL STRIP 3/8" X 1/4"
1/8" SOFT BALSA PLANKING
BALLAST BOX (3-5 OZ. LEAD) HOOK SHOWN IN DETAIL ON PLATE 2
ALL BULKHEADS SHOWN FULL SIZE ON PLATE 2
1" SQUARES
RUDDER - ALL 1/8" SHEET - HARD
ALL STABILIZER RIBS SPACED 1 1/2"
3/8" X 3/16" HARD
1/16" X 1/4" MEDIUM
1/4" X 1/4" HARD - TAPERED TO 1/4" X 1/8"
1/8" X 1/2" HARD
ALL RIBS SPACED 1 1/2"
1/4" SQ. HARD
1/8" X 3/8" HARD
1/8" X 1/2" VERY HARD
1/8" X 3/8" MEDIUM
1/16" SHEET FILLED IN ON TOP
1/16" SHEET GUSSETS AT ALL DIHEDRAL BREAKS
1/8" X 7/8" MEDIUM
ALL SPARS TAPERED
HOLES CUT AFTER ASSEMBLY
SLIDE BULKHEADS ON KEEL STRIP FROM EACH END — CHECK ALIGNMENT BEFORE PLANKING
TRAILING EDGE RAISED 3/16" DURING CONSTRUCTION
TRAILING EDGE NOTCHED 1/16"
Jim Ryan

— PLATE 1 —

CLOUD COASTER

How to build and fly a reliable contest winning sailplane—no motor trouble and no rubber or propeller to break

by **JIM RYAN**



TOWLINE glider flying is at last gaining the interest of model builders throughout the country; many cities now featuring glider contests as part of their regular model program. The towline glider gets its name from the method used in launching. The ship is towed into the air by a string or towline much the same as a kite. When it is nearly overhead the line is released and the ship sails free.

The average towline glider flown in contests today is either a copy of a man-carrying sailplane, with long efficient wings, or else it is assembled from the better parts of deceased fuselage and stick models. The model described here was designed for contest flying. Every part of the ship has been developed to give maximum performance as a model sailplane.

The model has won many places in contests including 2nd at the Scripps-Howard Nationals. Here it averaged over a minute, despite the fact that two official flights were made in rain. Since then it has been lost on thermals twice. When properly adjusted the ship can average almost a minute, on a 100 ft. towline, without the aid of thermals or ground currents.

This model is equipped with a rudder tab which is connected to the towing hook. This device makes it possible to tow the glider in a straight line, yet when the towline is released the tab will turn to give the model the proper amount of circle in the glide. This, combined with a very high lift airfoil and streamlined fuselage, makes this an ideal model for contest flying.

FUSELAGE: In most cases, during the construction of this model, the grade of wood to be used for each part is labeled (hard, medium, or soft). It is as important to use wood of proper strength as it is to use wood of proper size.

Fuselage is built up of formers and planked with balsa strips. Bulkheads are shown full size on plate No. 2. As only one-half of each is shown the following procedure is recommended: First trace half the bulkhead on paper, then fold along the centerline and cut out. This will give you a pattern of the complete former which is perfectly symmetrical.

Bulkheads are cut from 3/32" sheet balsa. Be sure the slot for the keel strip is in the exact position shown on the drawing. Before formers are cemented in place, check their alignment with a strip of balsa; it may be necessary to slide one or two of them slightly to the front or rear to secure an even contour.

Fuselage is planked with soft 1/8" balsa. However, for protection when landing on hard ground, the several planks on the bottom of the body should be of harder wood. The planking material is cut into strips about 1/4" to 1/2" wide; these are tapered and sanded before cemented in place. The planks should be placed alternately on one side, then the other, to prevent warping. (If the rudder control is to be used, it should be installed while the fuselage is only partly planked.) The seat for the wing is not cut to shape until both wing and fuselage are completed. The *hard* balsa nose block is glued to the front and cut to shape.

The fuselage is now sanded and given coats of wood filler or clear dope until a smooth, hard surface is obtained. It can now be painted and waxed to a high gloss finish.

The wing cover is made from any good grade of drawing paper. It should be given several coats of clear dope and colored the same as the fuselage. It is held in place with Scotch cellulose tape.

TAIL: A full size plan of the tail assembly should be drawn first. The stabilizer trailing edge is cut from 1/8" flat hard balsa and the leading edge from 3/16". The stabilizer is assembled as follows: First, with the leading and trailing edges pinned to a board, the lower part of each rib is cemented in place; then the spar is added, and finally the top part of each rib is cemented in place.

The entire rudder is cut from hard 1/8" sheet balsa. The tab should be cut at the same time as the rest of the rudder to insure a good fit. The rudder is assembled on a flat surface.

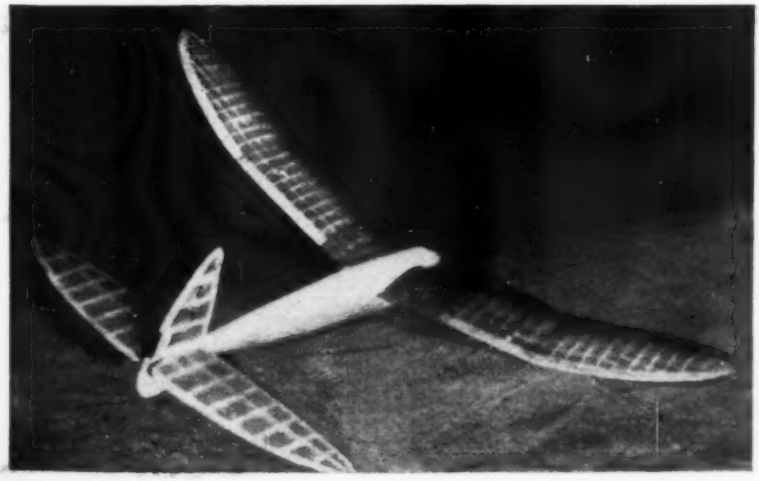
Both stabilizer and rudder are sanded and covered before they are attached to the fuselage.

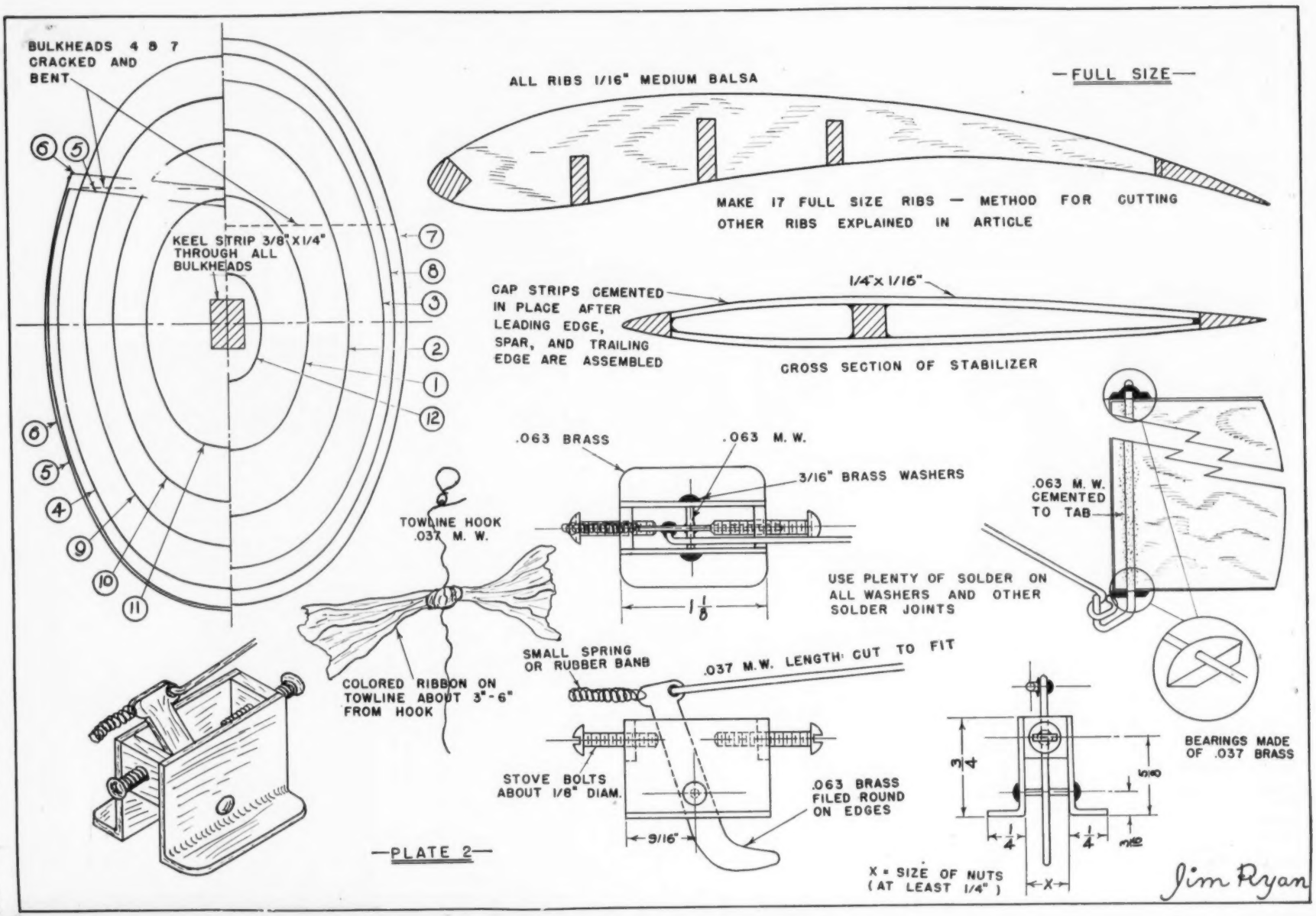
WING: The wing is the most important part of a glider and every care should be taken to produce a smooth airfoil, free from warps.

The wing ribs are all cut from 1/16" sheet balsa. Only the main rib is shown; this is because each wing tip rib must be fitted individually to each wing panel. The procedure for cutting these ribs is as follows: First, a flat sheet is cut to fit between the leading and trailing edges. Then, using the main rib as a template, cut the lower curve of the rib. Mark up 1/8" from the bottom at the rear of the rib and cut

(Continued on page 36)

Above and Below **The finished soarer with high lift wings and efficient streamlined fuselage**




BULKHEADS 4 8 7 CRACKED AND BENT
KEEL STRIP 3/8" X 1/4" THROUGH ALL BULKHEADS
ALL RIBS 1/16" MEDIUM BALSA
—FULL SIZE—
MAKE 17 FULL SIZE RIBS — METHOD FOR CUTTING OTHER RIBS EXPLAINED IN ARTICLE
CAP STRIPS CEMENTED IN PLACE AFTER LEADING EDGE, SPAR, AND TRAILING EDGE ARE ASSEMBLED
1/4" X 1/16"
CROSS SECTION OF STABILIZER
.063 BRASS
.063 M. W.
3/16" BRASS WASHERS
1 1/8
TOWLINE HOOK .037 M. W.
COLORED RIBBON ON TOWLINE ABOUT 3"-6" FROM HOOK
USE PLENTY OF SOLDER ON ALL WASHERS AND OTHER SOLDER JOINTS
.063 M. W. CEMENTED TO TAB
SMALL SPRING OR RUBBER BAND
.037 M.W. LENGTH: CUT TO FIT
STOVE BOLTS ABOUT 1/8" DIAM.
.063 BRASS FILED ROUND ON EDGES
9/16"
BEARINGS MADE OF .037 BRASS
X = SIZE OF NUTS (AT LEAST 1/4")
Jim Ryan

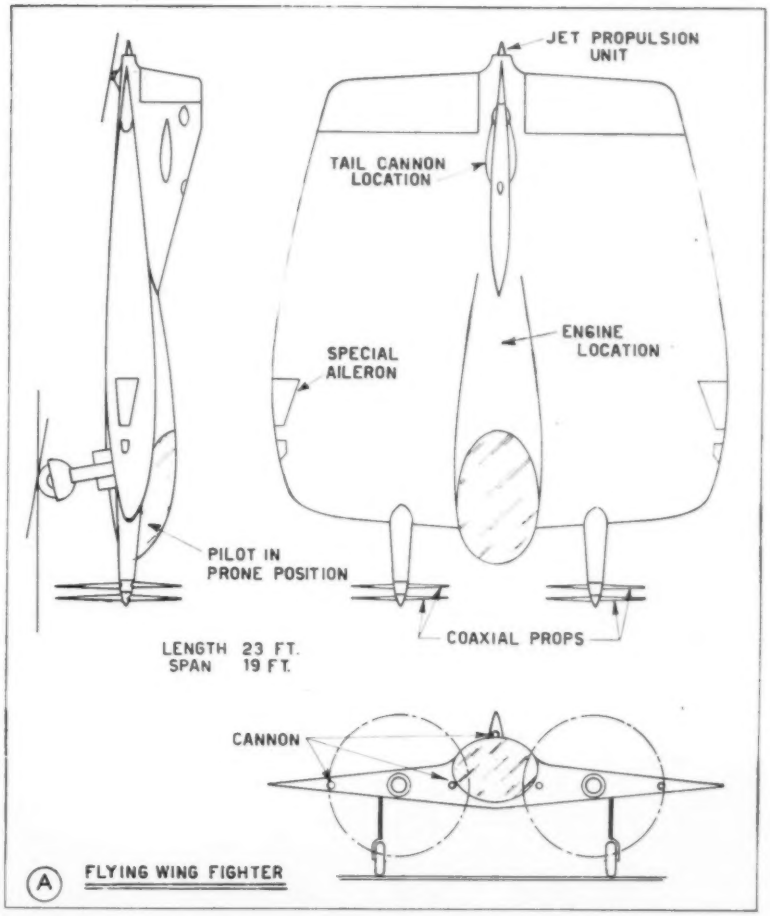
—PLATE 2—

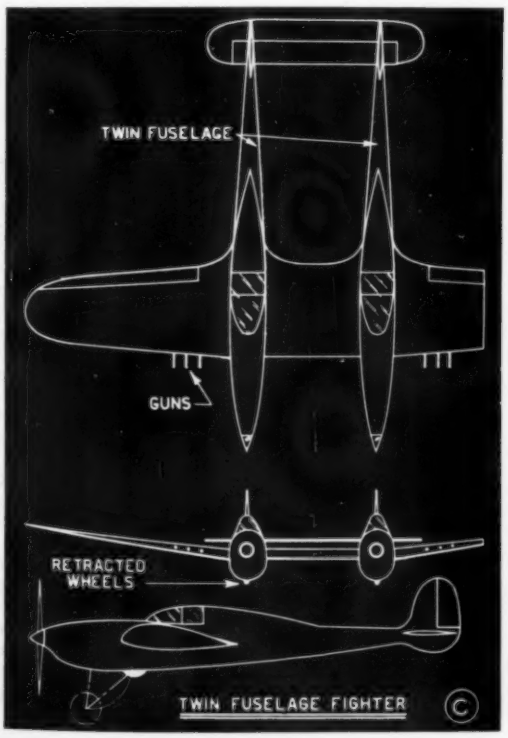
DESIGN FORUM

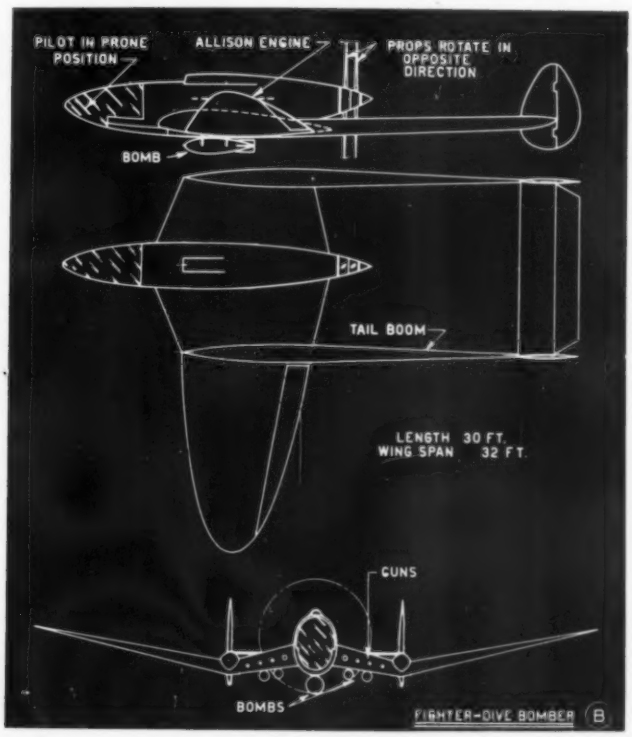
Analysis and discussion of ideas submitted by readers

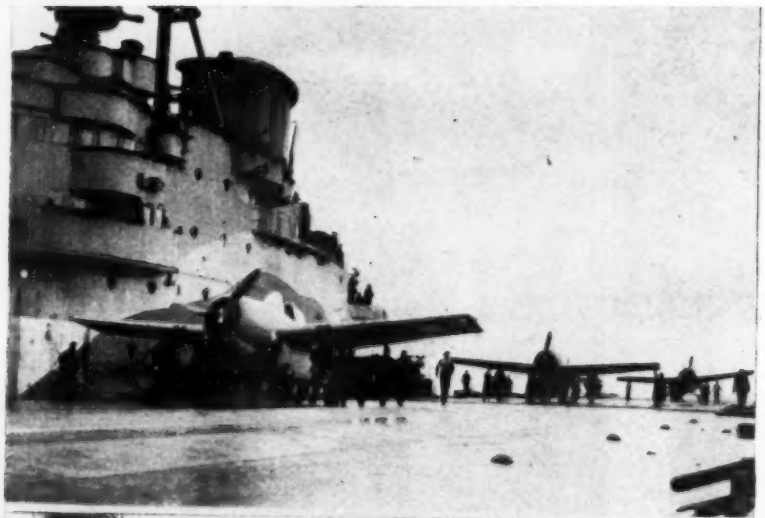
OUR readers' response to the Forum has been gratifying, indeed, and the many letters we have received indicate your enthusiasm over the discussions of your own ideas on airplane design. Certainly many of you do not lack originality and none of you seems to lack optimism. Of such stuff are great futures built and without it no nation, and certainly no industry, could long exist. However, some of the designs received have been lacking in an understanding of the basic principles of statics, dynamics, mechanics and other basic physical sciences. No engineer or scientist, regardless of how brilliant he may be, ever for a moment forgets the fundamentals of the sciences as laid down by such men as Newton, Ohm, Hook, Kelvin, Rankine, Otto, Watt and the many others. A few of the designs submitted break down through failure to observe these basic laws and had the designer exercised such fundamental knowledge he could easily have criticised his design earlier in the process.

(Continued on page 38)









FRONTIERS

Latest and most important developments in the science of air war

Photos by British Combine, Acme and International

TO DEVELOP a new airplane requires as much time as to produce a new battleship.

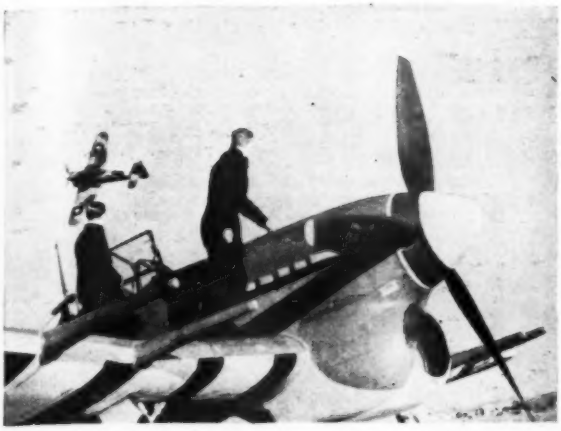
Four years ago first sketches of the Republic P-47 were laid out: just recently this plane went into battle action over Europe. The thousands of engineering problems arising in a complicated highspeed job such as this one is what takes the time. According to information released, over five thousand changes were made after the original mockup, and this does not take into account the myriad calculations and experiments made before the fighter took form.

Top picture, page 20, shows the new "skyblaster" ready for action. This barrel-bellied plane escorted the Flying Fortresses on that devastating raid on Antwerp, Belgium, and let it be said to the everlasting credit of the Thunderbolts that while they sustained losses themselves, fighting off squadrons of Focke Wulfes that tried to break up the bomber formation, every one of the huge "Forts" got back safely.

Two important factors in its initial success were speed and firepower. Speed is well over 400 mph, enough to catch any enemy fighter and hurl destruction at it from eight .50-calibre machine guns. Its 13,000 lb. are hauled by Pratt & Whitney engine.

During the past year much has been written about the clawing Grumman Wildcat, shipboard fighter that has ripped into the sons of Nippon time and again. American airmen think these planes "are the cats," a belief evidently shared by the British (who call it Martlet) for in the second and third

(Continued on page 40)



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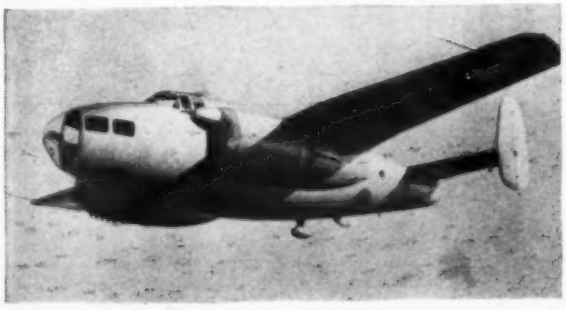


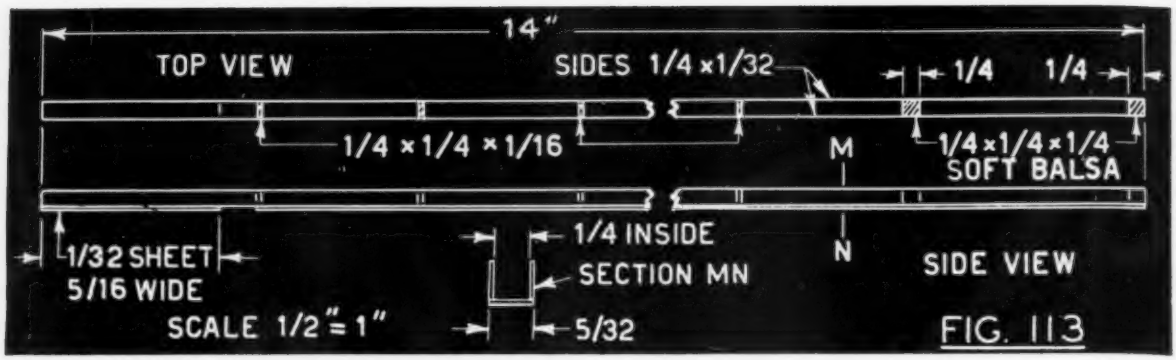


FIG. 113

MODELING YOUR FUTURE IN AVIATION

Official Air Youth Course in model aeronautics

by **CHARLES H. GRANT**

Lesson 14—How the Tail Moment Arm Affects Stability

ONE of the best ways of studying aerodynamics and acquiring a thorough knowledge of flight principles is to experiment with model planes: the effect of different airplane proportions can be readily tested at little cost.

Last month's article discussed the function of tail surfaces and showed how, through experiment, a clear demonstration of the effect of their size could be obtained. No doubt those who carried out the tests outlined had some interesting experiences and possibly increased their aeronautic knowledge. They should have discovered that stabilizer size coptrols longitudinal stability, and fin size directional stability. However, the size of these surfaces is not the only governing factor: their position also has a decided effect upon stability.

So the purpose of the second series of experiments will be to determine how the plane reacts when the stabilizer and fin are in different positions relative to the wing.

The same test plane can be used that was used in the first test series; however, it will be necessary to build a boom extension for

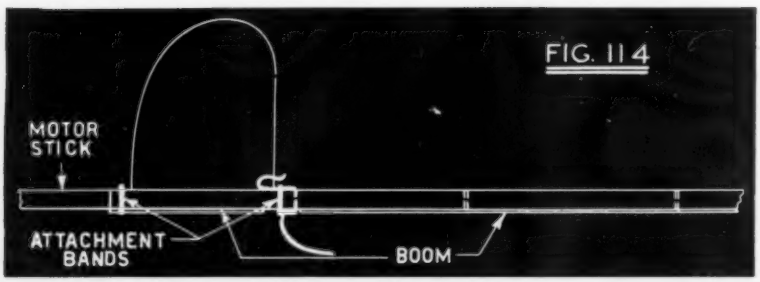


FIG. 114

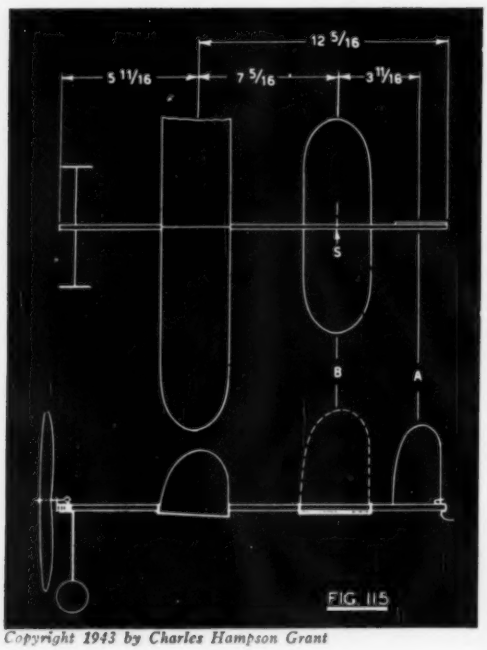


FIG. 115

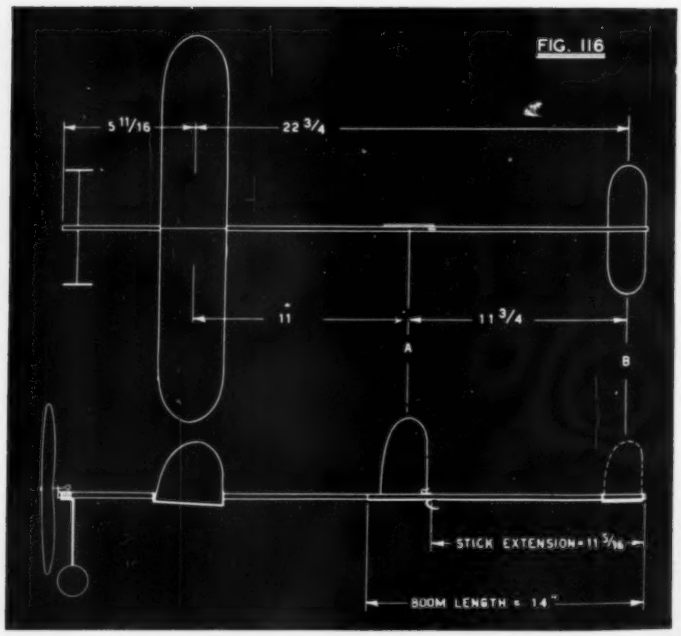
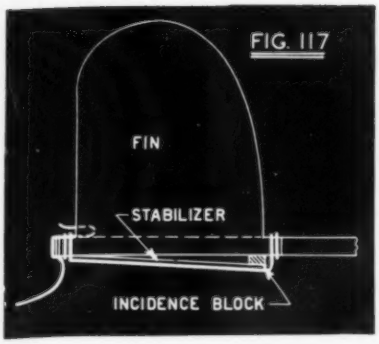
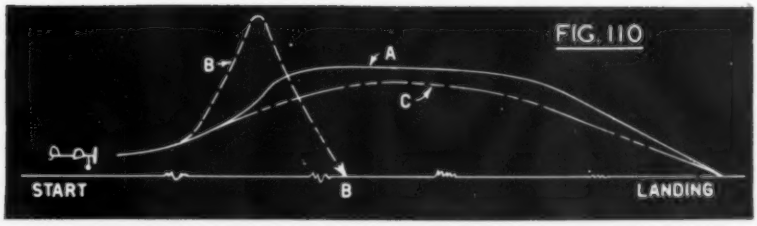
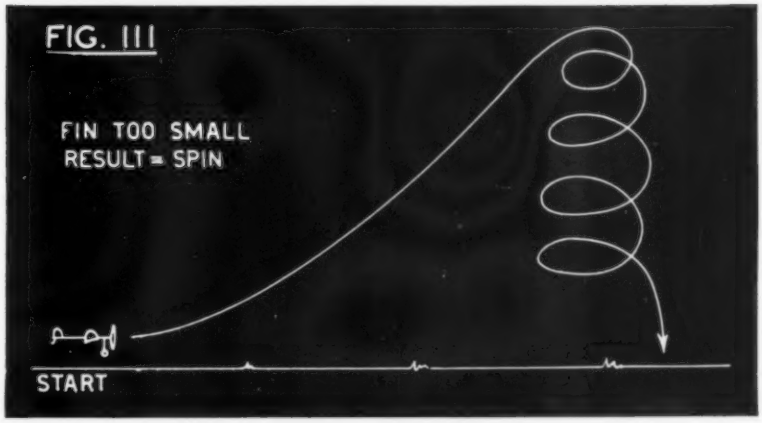


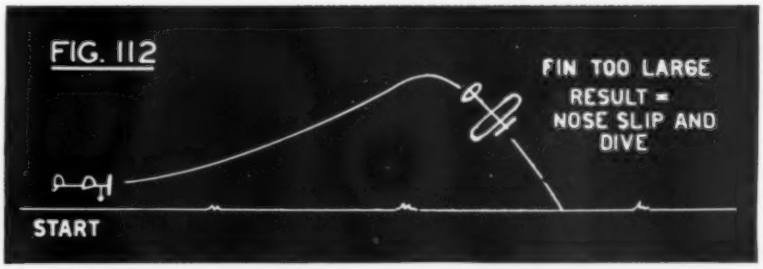
FIG. 116

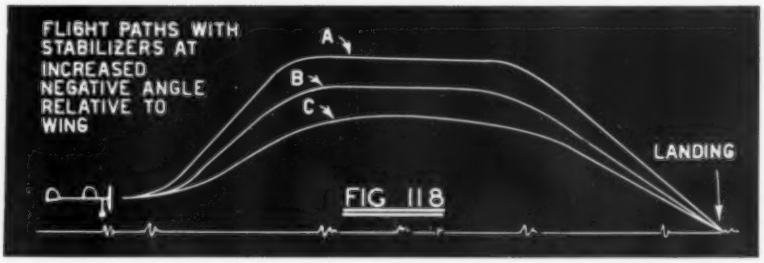
Copyright 1943 by Charles Hampson Grant











the motor stick. This makes it possible to place the stabilizer and fin further from the wing; in other words, to increase the tail moment arm. This is important in studying the effect of various moment arm lengths.

So before going to the test field with your model, construct a light boom as shown in Fig. 113. This is built up of two strips of 1/32" balsa placed vertically, with small blocks between them holding them together. On their underside are glued strips of 1/32" sheet. There is one short piece glued to the forward underside, as indicated on the drawing. To the rear of this is another sheet extending the remaining length of the boom. A careful study of the drawing will give a clear idea of construction.

This boom fits over the rear end of the plane's motor stick and extends rearward as indicated in Fig. 114. The front end of the boom fits up against the rear of the stick so the tail skid passes down through the open space in the underside covering. The boom is held in place by rubber bands encircling the stick and boom at the latter's front end, and again at a point in front of the tail skid. The ears of the fin fit through these rubber loops on the side of the boom, in the same manner as indicated in the previous article.

Be sure that when the boom is in place, its lower edge is parallel and a continuation of the underside of the motor stick; in other words, the boom should not be bent up or down at an angle from the motor stick. When attached to the test plane it will enable you to place the stabilizer or fin, or both, at its rear end, thereby locating them at a distance from the wing double that of the normal test plane. The boom parts should be cemented together carefully and when finished you are ready for your journey to the flying field and an interesting few hours testing your model in actual flight. Of course, do not forget to take along your tool kit with extra wood and cement; there is always the danger of a hard landing and a few broken parts. With the proper materials on hand, breaks can be easily repaired and test flights resumed in a few minutes.

Now that you are at the field and have determined the direction of the wind, you select the proper spot from which to launch your model. First test the model with a short tail moment arm. Place a mark on the top side of the motor stick 13" from the nose of the plane, or about 7-5/16" from the center of gravity (center of wing). The center of each stabilizer should be located at this point during all tests.

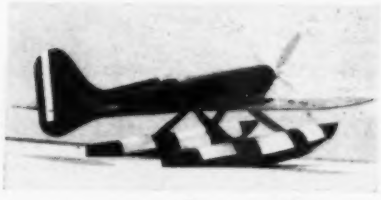
First fasten a normal fin at the end of the stick, as shown in position A, Fig. 115. Then place the normal size stabilizer with its center over the point marked on the stick—position B. Now you have the normal test plane with the stabilizer placed about 33-1/3% closer to the wing center than specified in the basic model. Test the plane in the normal manner with the surfaces in this position after carefully balancing it with weights as described last month. Wind up the motor as described in the previous article, and launch it carefully in a *horizontal* position. Watch the flight closely as it progresses. You will note that the ship will be stable directionally, but longitudinally stability will be slightly lacking, the plane having a tendency to either nose up or down more sharply than in the case of the basic test model. Performance will be similar to the test model equipped with the very small stabilizer—Fig. 105, July issue, the flight path resembling B, Fig. 110. Possibly it may not climb and recover as abruptly as shown in B, but it will be similar, the plane lacking longitudinal stability.

Now detach the normal stabilizer and replace it with the small one (Fig. 105, July issue). Test this surface in the usual manner. As you might expect, the plane will be still more unstable, stabilizer area being very small. For the third test use the large stabilizer (Fig. 104, July issue), being sure to place its center directly under the mark on the stick. Wind the motor and fly the plane carefully. The flight path should re-

(Continued on page 60)

1

2



3

4 above—5 below

News of model plane experimenters from all parts of the world

THAT Aeronka K seaplane in picture 1 appears to be making a perfect flight, but its builder, Dan Merkey of La Porte, Ind., confesses it was wire-strung up there. Dan goes on to say that though it glides well he would not risk cracking it up in free flight.

Meet the champ! He is Sgt. Harold J. Elias, AAF Technical Training Command School, Chicago, Ill.

The sergeant's winning entry is the remarkable scale model Boeing B-17E you see at his feet as he receives his trophy—picture 2. His model was the unanimous choice for top honors, chosen by a board of experts representing the "Chicago Times" Air Cadets in conjunction with the International Sportsmen Show and the National Exchange Clubs.

Sharing the spotlight with Sergeant Elias were Michael Surufka of Posen, Ill., whose Gulfhawk entry required more than five years to build, and Harold Daunis, United Airlines, with a perfect replica of Roscoe Turner's famous racing plane. Other trophy winners were as follows: Gene Ostrin, W. H. Griswold, Hollis Freeman, Joe Matulis, Kenneth Thomas, C. J. Hein, Al Klippert, George Bucic, Henry Smith, John Poltera, Hubert Meyers, Ronald Aschburner, Kenneth Flagor, Albert Weidlick, and Gerald Seiple.

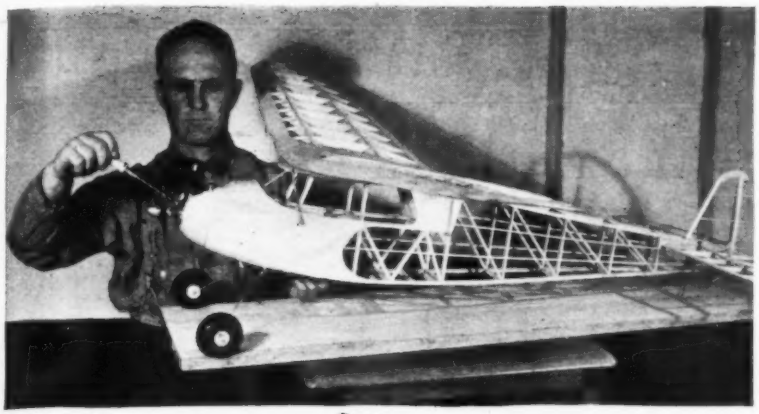
Feminine modelers were much in evidence. Dorothy Heines, representing the Lakeview (Ill.) contingent, won top honors among the girls, with Thelma and Betty Smith runners-up in the order named.

A. Krueger of 3996 Welland, Los Angeles, Cal., constructed this neat Macchi-Castoldi 72, shown in picture 3, from plans that appeared in MODEL AIRPLANE NEWS, September, 1934, issue. The original, known as the "Red Bullet of Italy," held the world speed record of 423.7 mph. The model, made from plans which Krueger calls very complete, took 310 working hours to finish. Props in tandem rotate opposed; rudder and stabilizer are adjustable—but just for show—its builder thinks it is too nice to fly.

Let Ralph Moll of Wamego, Kansas, tell you about his Super G-line Shark, pictured in No. 4:

"This model is really fast, over 90 mph, and the motor was not completely opened up. I expect to get well over 100 mph from it. The plane has a 24" wingspan, 27" length overall. The cowling has been redesigned for easier accessibility to the motor and it carries a self-designed prop, self-.

(Continued on page 54)



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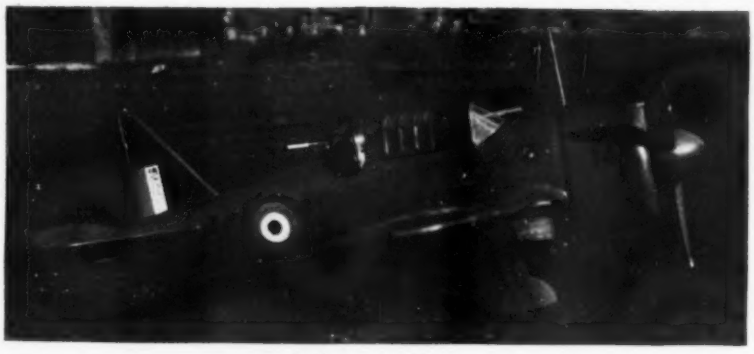


9 *above*—10 *below*

11

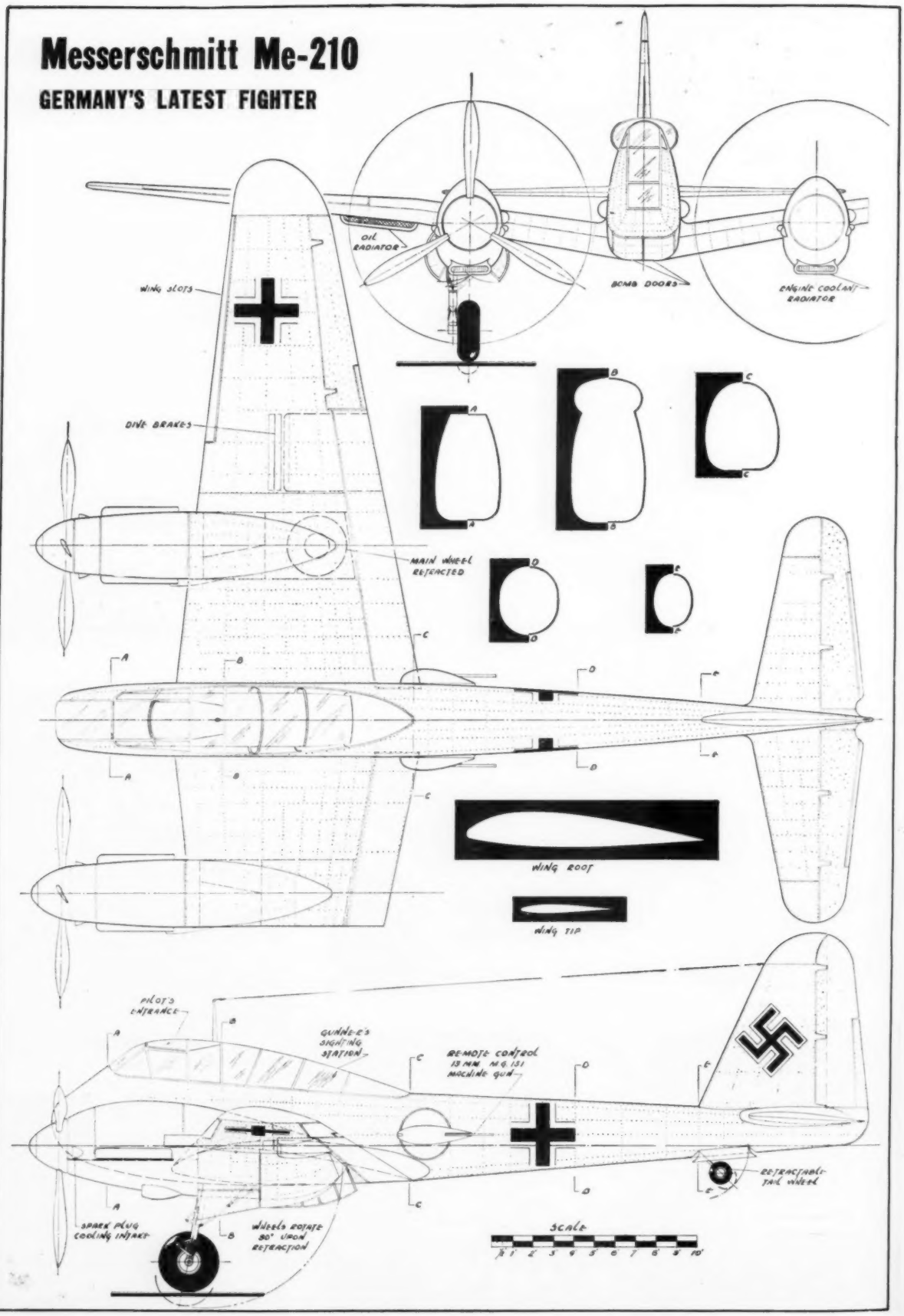
12

13

14 *above*—15 *below*

Messerschmitt Me-210

GERMANY'S LATEST FIGHTER



AXIS ASSASSIN

Plane on the cover

CLOSE of the last World War found a young officer out of a job, penniless and tired but with a host of friends and a first-hand knowledge of aviation and airplanes. Oberlieutenant Ernst Udet left the battlefields of the sky as Germany's greatest living aerial ace and his score of 62 Allied planes downed in combat was second only to the immortal Rittmeister Manfred von Richthofen, peer of all first World War I sky fighters. Young Udet, the job done, visioned a brilliant future for the airplane and obtained enough capital from his friends and acquaintances to organize the Udet Flugzeugbau, G.m.b.H. in Munchen, Germany in 1921. In 1926, after the successful design and manufacture of several sportplanes (Germany was forbidden production of military airplanes in the Treaty of Versailles) he sold his interest in the firm to the Bayerische Flugzeugwerke; this new firm also acquired the famed Bayerische Rumpler Werke and entire assets of the new firm were transferred to the old Rumpler works at Augsburg. The great depression in Germany, in 1931, which spawned Hitler and his Nazi Party, forced the B.F.W. into bankruptcy which afforded an opportunity for one of its engineers, Professor Willy Messerschmitt, to acquire the firm's assets with the financial aid of associates. With Messerschmitt as chief designer, the B.F.W. undertook the design of a "sport" monoplane known as the B.F.W. 109 which was destined to play an historic role in the dark days to come. At the same time, another firm, Daimler-Benz Aktiengesellschaft, produced a "sport" engine for the B.F.W. 109 "sport" plane. This organization claims to be the world's oldest automobile and engine manufacturer; formed by the merger of the famous Benz et Cie of Mannheim and Daimler Motoren Gesellschaft of Berlin. Daimler is generally considered the father of the modern internal-combustion engine; Benz is most famed for his production of the Mercedes engine (named after his daughter), which powered many German Imperial Air Force fighters and bombers during World War I.

This new engine, the Mercedes-Benz DB-600, developed 1,050 hp. and was selected by Willy Messerschmitt for his BF-109. When Hitler abrogated the Versailles Treaty, both this airplane and engine were placed in production. In 1938, the B.F.W. was reorganized as the Messerschmitt A.G. and the Mercedes-Benz became known as the Daimler-Benz DB-601A.

From the original B.F.W. 109 (MODEL AIRPLANE NEWS, November 1938 issue) to the modern Messerschmitt Me-109F has been a period of gradual refinement and improvement of performance, stability and control of the type and a special version of this machine now holds the present recognized World's Airplane Speed Record of 481.4 mph set by Herr Fritz Wendel on April 27th, 1939.

In 1938 work was begun on a twin engine two-plane fighter machine to be powered by two Daimler-Benz DB601's and to carry heavy armament. This craft, the Messerschmitt Me-110, became as successful and renowned as its smaller brother. Armed with two 20 mm. cannon and four 7.9 mm. machine guns firing forward and a single flexible machine-gun in the rear cockpit, the Me-210 became the terror of the Western Front prior to perfection of the British Spitfire.

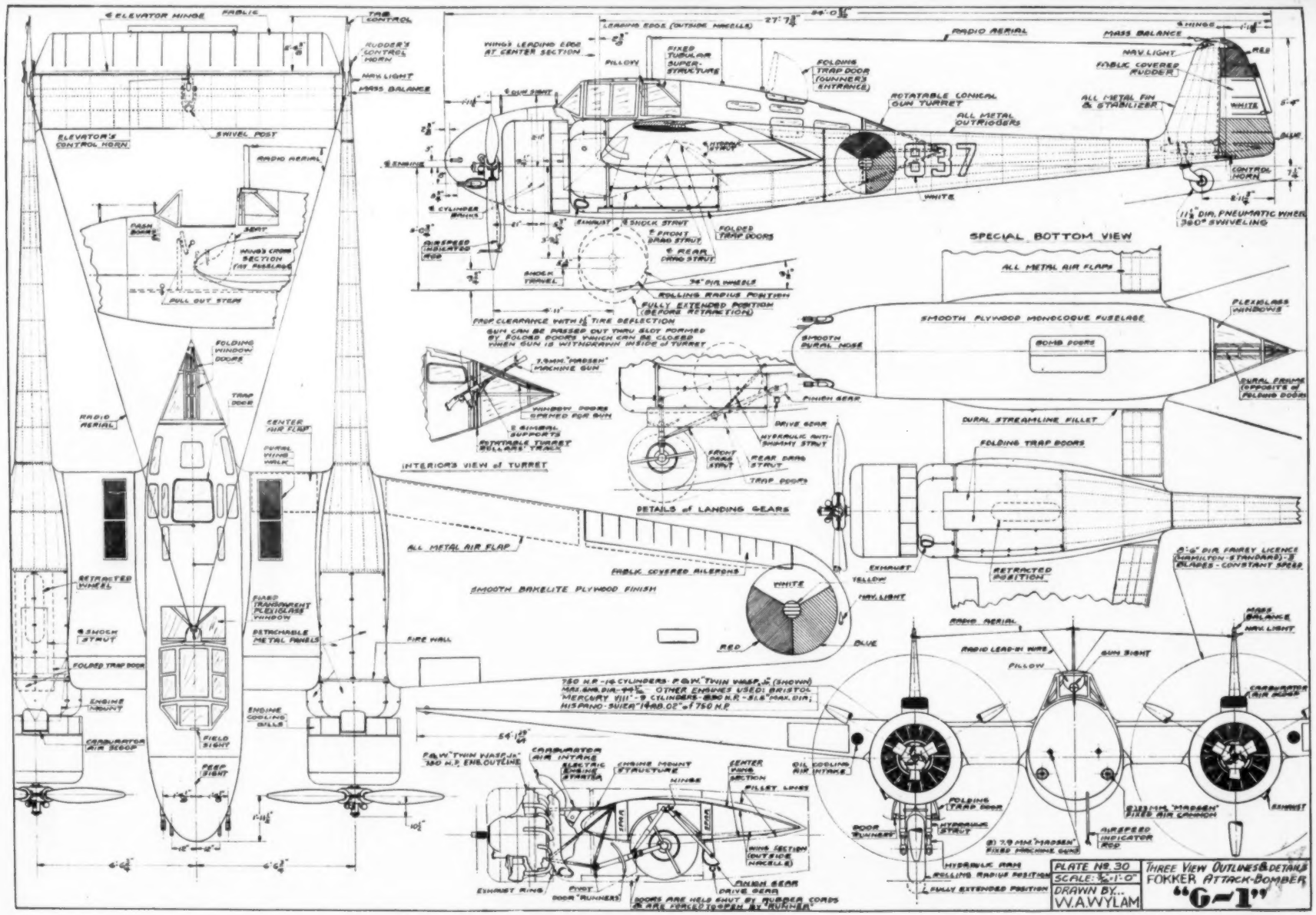
In 1941 the firm, after extensive analysis of experience gained with this design, started construction of an improved version of the general type with several of its more obvious defects corrected. Result is the Messerschmitt Me-210, our Plane on the Cover this month.

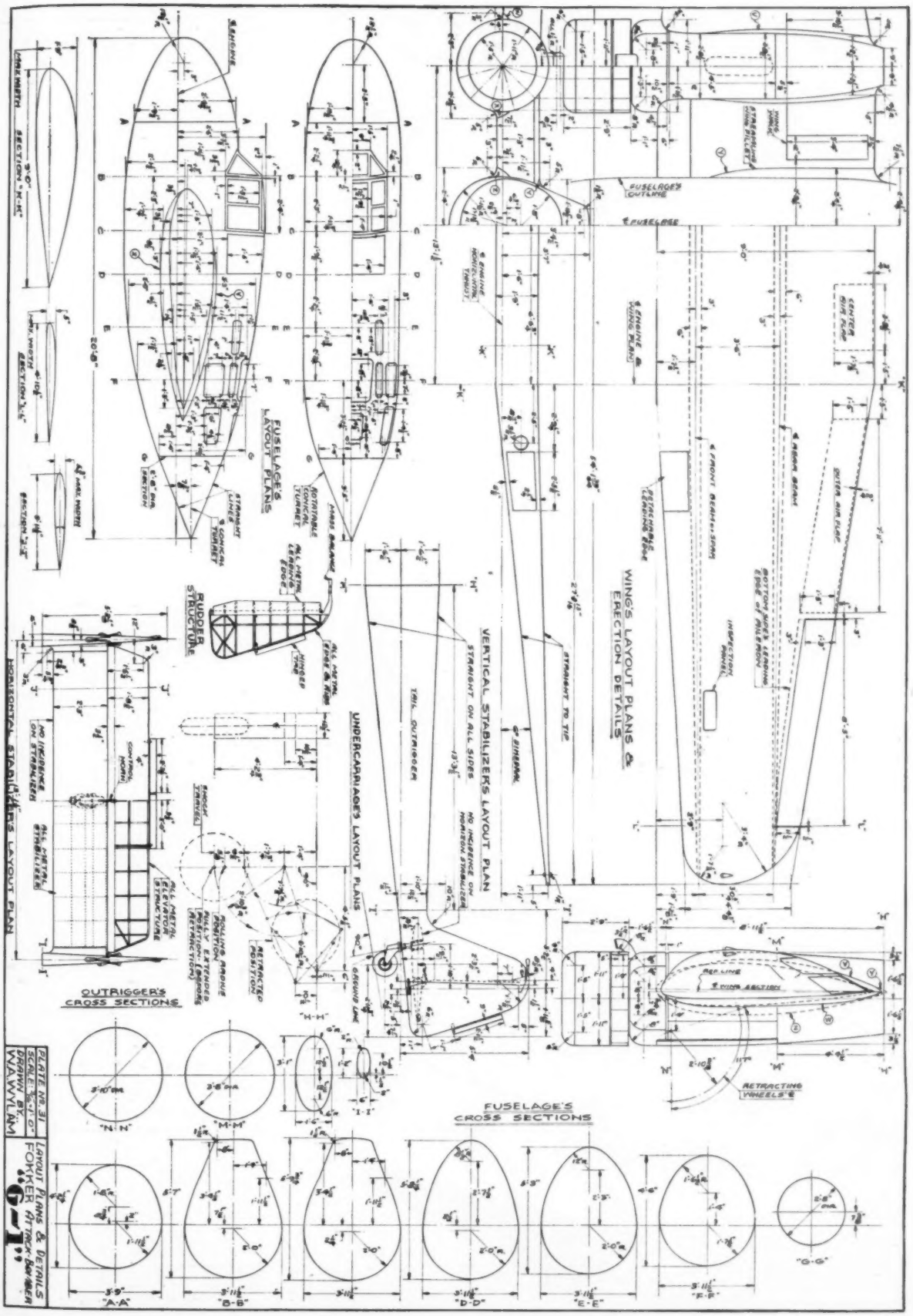
The Me-210 is almost identical to the ME-110 in external appearance as well as over-all dimensions; most obvious changes being replacement of earlier twin rudders with a single vertical surface, and complete alteration of the crew enclosure.

Wing is the single-spar type, made up of seven sections. Wing tips are removable and the two inner wing panels have a larger dihedral angle than the two outer wing panels. The spar is carried through the fuselage in a truss structure to which the inner wings are bolted. The spar consists of a single shear web to which L sections have been riveted at top and bottom to serve as spar caps. Channel stiffeners of the hat-section type are riveted to the shear web in a vertical direction at points of load concentration. In assembly the inner wings are attached to the fuselage spar section to form an integral unit and the outer wing panels are attached by large ball-and-socket joints as used on the Junkers designs. Ribs are of sheet metal with stamped flanges by hydro-press replacing the built-up riveted truss type used on the Me-110. The stamped ribs are made much more rapidly than the former type.

Conventional ailerons are provided inboard of each tip along the trailing edge of all metal structure fabric-covered. Static mass balance weights are mounted beneath each aileron; left aileron is equipped with a controllable trim tab. Wing flap panels extend from the fuselage outboard to the

(Continued on page 51)

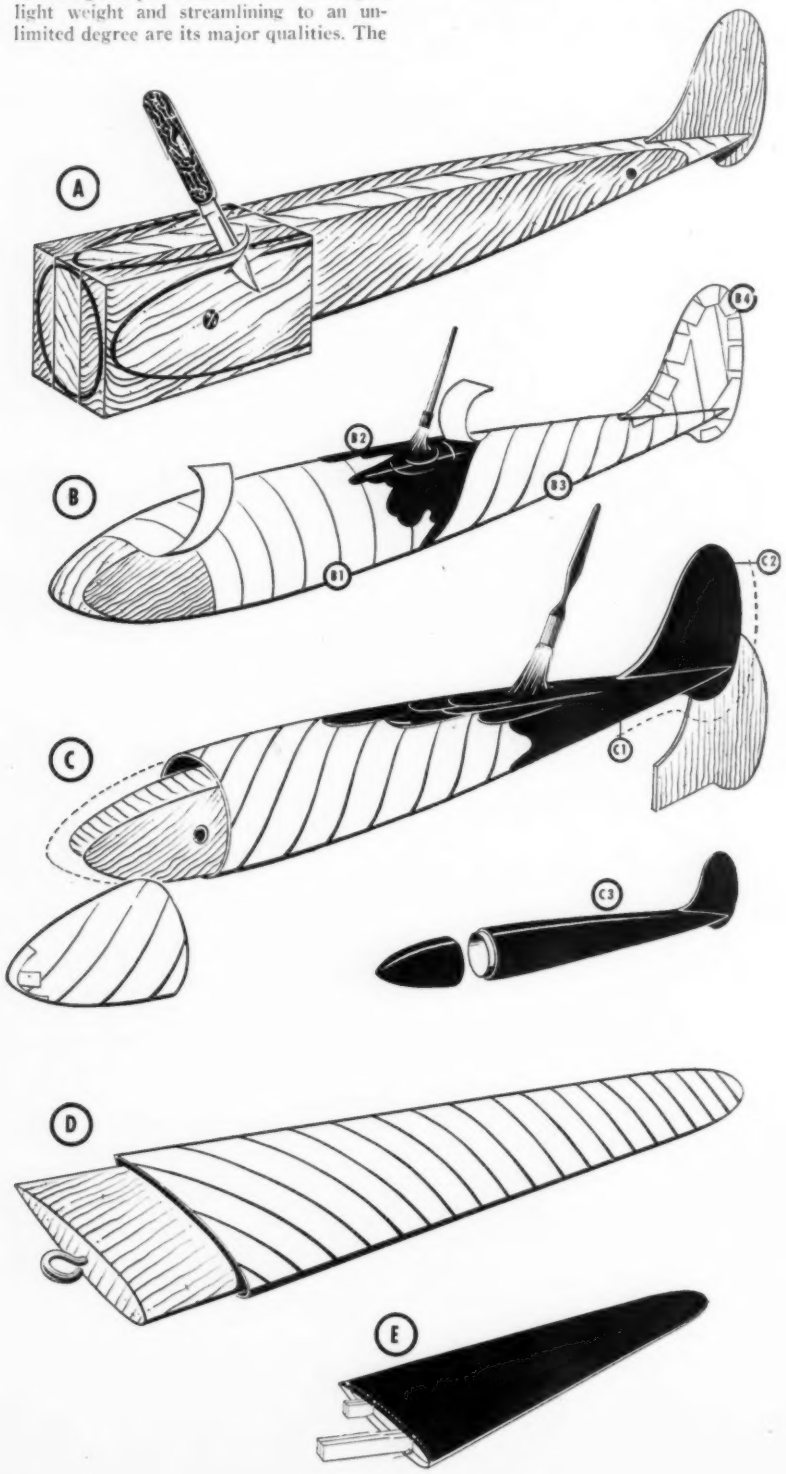

SPECIAL BOTTOM VIEW
INTERIOR'S VIEW of TURRET
DETAILS of LANDING GEARS
RETRACTED POSITION
PLATE Nº 30
SCALE: 1/2"=1'-0"
DRAWN BY... W.A.WYLAM
THREE VIEW OUTLINES & DETAILS FOKKER ATTACK-BOMBER "G-1"


FUSELAGE'S LAYOUT PLANS
WING'S LAYOUT PLANS & ERECTION DETAILS
VERTICAL STABILIZER'S LAYOUT PLAN
HORIZONTAL STABILIZER'S LAYOUT PLAN
RUDDER STRUCTURE
UNDERCARRIAGE'S LAYOUT PLANS
OUTRIGGER'S CROSS SECTIONS
FUSELAGE'S CROSS SECTIONS
RETRACTING WHEELS'S
PLATE NR. 31 LAYOUT PLANS & DETAILS
SCALE: 3/4"-1'-0"
DRAWN BY WAWYLAM
FOKKER D-VII ATTACK FIGHTER

PLANE TRICKS

by **R. L. BROWN**

DUE to a shortage of balsa wood, thought is being directed toward substitute materials which may prove very successful. Laminated paper models seem to offer great possibilities. Great strength, light weight and streamlining to an unlimited degree are its major qualities. The forms, which can be carved from soft pine or any scrap materials, can be used repeatedly, or finished up as display models. Thus, when your paper model flies out of sight you will have a solid display model to remember it by. Helpful tools include pocket-knife, draw-knife, plane, chisel, brush, pins, sandpaper and drill.



A

Make the fuselage block of three pieces held together with a screw at the nose and at the tail. Slot rear and slide in rudder. Do not secure, but leave in a slip fit. Shape the fuselage, close the surface with shellac or dope, sanding between coats. Finish with wax.

B

Christmas tissue paper, rice paper or old newspaper, cut in 1" strips and dampened slightly, should be carefully wrapped around the fuselage.

B-1. Cover completely. Don't leave any wood exposed. Where there is more curvature use narrower strips. Wipe off excess moisture and let dry.

B-2. Spread on a coat of glue or dope and apply a second layer of strips.

B-3. An excess of glue soaks through the first layer of paper. Use it sparingly.

B-4. Note additional strips of reinforcing which can be applied at weak points.

C

Place model in a warm, dry place and allow to dry thoroughly. Don't dry in an oven or in the sun. Heat applied in this manner may affect the wood form, and possibly split the paper shell.

Select point of greatest crossection and cut through shell. Remove the nose portion. Take out exposed nose screw. Cut small hole at rear of fuselage shell and remove screw. Repair this later. Remove center block first; this allows the other two blocks to slip out easily.

C-1-2. An incision from C-1 to C-2 allows the rudder section to be removed. This cut can be mended with short strips.

C-3. A slight shoulder, possibly 3/4" wide, is made by wrapping a strip around the inside of the shell. The nose can be glued on permanently or fastened with pins to allow future removal.

Complete the laminated paper fuselage with two coats of colored dope.

D

Carve a solid wing from white pine. Fill the wood pores with dope or shellac and sand smooth. The wing is built in halves, with a big

screw eye inserted in the end to give something to pull by in removing from the finished paper shell. The shell is applied in narrow strips, several layers thick. One main spar is built, strengthened with dihedral bracers and, after liberal glue application, is inserted in the wing shell. One short, rear center section spar is inserted after the main spar dries.

Use short reinforcing pieces of paper around the wing tips. These should be strong to withstand the impact of bad landings. Cut little V's around the edges of the strengthener strips to facilitate their easy application to the tips.

E

Ribs in short pieces can be inserted at the wing root for added strength. These should be set in at least 1/8" for greatest gluing area. If you like, use a dihedral bracer on only one side of the main spar, as shown. Try using stub spars, too. Let these extend only about one-half the distance to the tips. Even the main spar can be made of cardboard in channels or Z shapes instead of wood.

Elliptical shaped wings with curved front view and changing rib shapes (from root to tip) are just as easy to cover as tapered wings with straight leading and trailing edges.

F

If your design permits, use an adjustment slot, at least until the proper wing position is found. Then glue solidly and apply wing fillets. The offset wing spar design shown eliminates dihedral bracer but necessitates placing one spar slightly ahead of the other. For a midwing, insert a strong bulkhead with a hole just big enough to amply clear the rubber motor. Cut the wing spars short, and glue and pin securely to the bulkhead.

G

Beef-up rudder and stabilizer tips with short V-cut reinforcing strips applied around the edges.

Insert the wings in the fuselage slots and bind and glue securely. Temporary or permanent setting is maintained by the rubber strands over the fuselage.

H

Empennage assembly is described in the next paragraph and is shown completed at the left. Small rudders under the fuselage give the whole rudder assembly added strength.

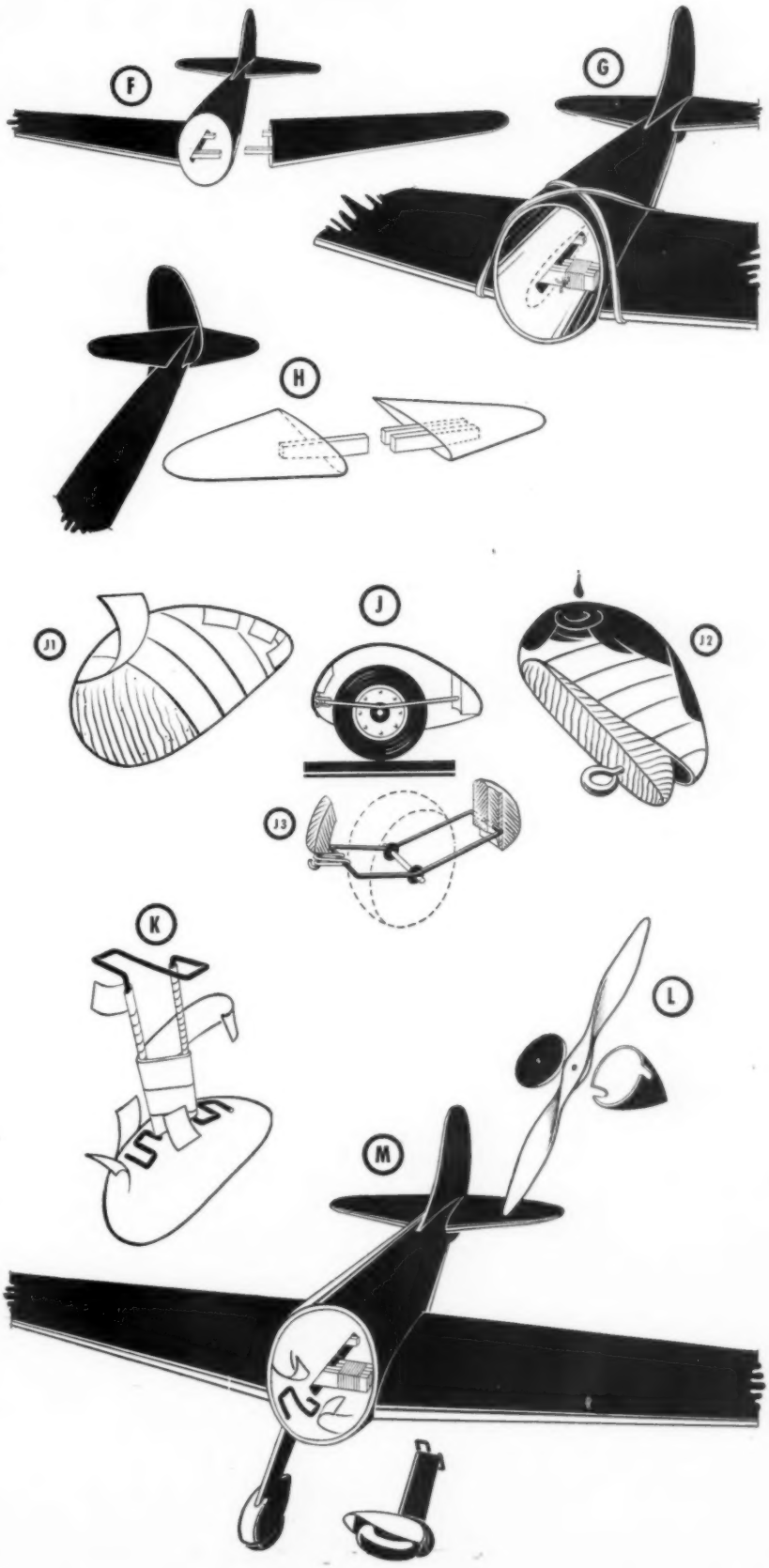
Mount the stabilizer or wing as shown. Use two stub spars on one side, and one on the other. Slide the two half wings together securing with glue, pins and glue, or thread wrapping and glue.

J

J-1. Carve the wheel pant, finish the surface, wax, and cover with strips of paper as shown. Several layers will be necessary.

J-2. Finish wheel pant with colored dope, and remove the wood form with the assistance of a large screw eye.

(Continued on page 54)



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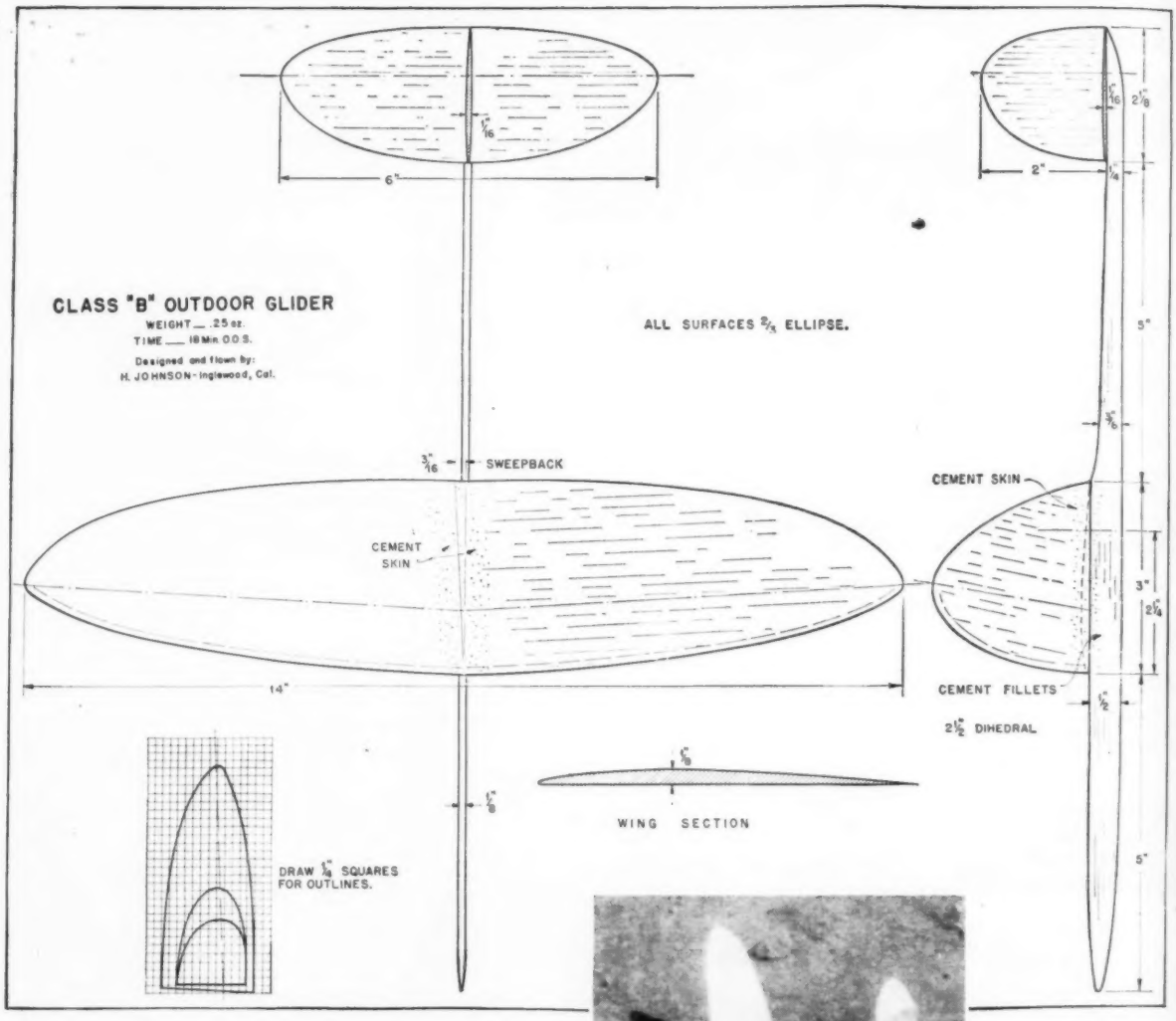
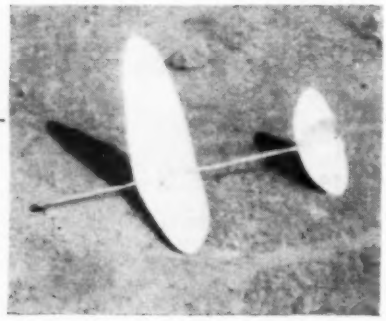




The glider ready for business

by **HARRY JOHNSON**

How to build a high performance contest glider for indoor or outdoor flying

DUAL PURPOSE H. L. GLIDER

THIS simple glider is designed for either indoor or outdoor flying. It is made very light because this improves floating ability, yet will be sufficiently strong if wood is carefully chosen and all joints well cemented. When properly built and adjusted this glider will give excellent performance. The original design has made many flights from seven to eighteen minutes, several having disappeared from sight.

WING: Wing outline is the 2/3 ellipse design which is very efficient. Draw a full size plan of the wing on paper ruled with 1/4" squares. Then select a piece of 1/8" x 3" x 14" sheet balsa which is strong and very light; cut to the outline, and sand to the section shown beginning with No. 1 sandpaper and finishing with a very fine grade. Be very careful in sanding the wing, because the wood is easily dented and chipped. Trim the frayed edges off the sandpaper and work on a smooth surface. Next, dope the wing and sand with fine sandpaper between coats, repeating this until a smooth shiny surface is obtained. Cut the wing at the center and join carefully, raising each tip 2 1/2".

FUSELAGE: Select a piece of very hard straight-grained balsa 1/8" x 1/2" x 1/5"; 1/8 sheet balsa is much better for fuselages than 3/16" or 1/4" because it is lighter and absorbs shocks more readily. Sand roughly to a tear-drop section and finish with very fine sandpaper. Dope and sand until the fuselage is very smooth.

STABILIZER AND RUDDER: Make the stabilizer from a piece of very light sheet 1/16" x 2-1/8" x 6". Prepare the stabilizer and rudder in the same manner as the wing, sanding them to section shown in the plans. Use less dope on the tail surfaces, since too much is apt to warp them.

ASSEMBLY: Attach the wing to the fuselage securely with three coats of cement covering approximately 3/4" on each side of the joint. With the trailing edge offset 1/32", cement the rudder on the stabil-

(Continued on page 48)

SPOT THESE PLANES

Silhouettes and description of enemy planes helpful to plane spotters

IN RECENT discussions with officials of the Office of Civilian Defense, leader members of the Academy of Model Aeronautics have been informed that volunteers over sixteen years of age are still needed in most areas as observers.

We know that you want to help, so—HERE'S WHAT YOU SHOULD DO IMMEDIATELY:

1. *As an Individual:* Apply to the local Defense Council. If you are not sure of its location, inquire at your nearest police or fire station or check with county officials. If you can't find any local Defense Council, write to your Governor and ask him to have the State Defense Council notify you of your nearest unit. Explain your experience in model aviation and offer your services in the aircraft warning service or in any other capacity where you can be of help.
2. *As a Group:* Your model airplane club or group can be of great service in your community in this vital defense work. Call a meeting. Adopt a resolution similar to the following:

   By unanimous vote of all members present at this special meeting of the .....
   Name of Club
   meeting at ..... (city)—(state) on this ..... day of January, 1942, the following resolution is hereby adopted:

WHEREAS, the members of this club feel that they might be of assistance by contributing a portion of their time in the interest of National Defense; and

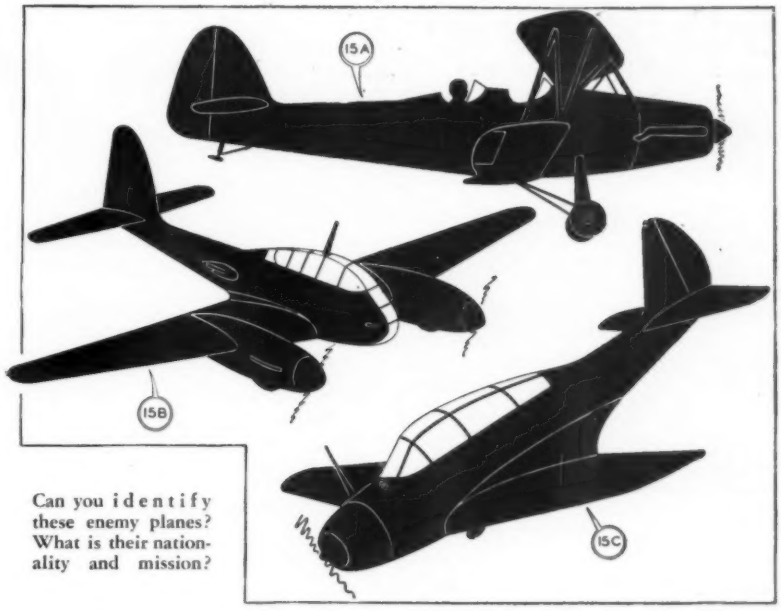
WHEREAS, the members of this club have acquired a general knowledge of aircraft through their activity in model aviation; and

WHEREAS, it appears that this general knowledge of aircraft might be of value through serving in the Aircraft Warning Service;

BE IT, THEREFORE, RESOLVED that the members of this Club, whose signatures appear below, do hereby offer their services to the.....State Defense Council both jointly and severally to serve in the Aircraft Warning Service or in any other capacity the Council shall designate.

Upon adoption of the above or similar resolution it should be presented by your club president, or senior advisor, to your local representative of the State Defense Council.

THIS SERVICE IS OF VITAL IMPORTANCE TO OUR COUNTRY'S SAFETY—VOLUNTEER NOW!



Can you identify these enemy planes? What is their nationality and mission?

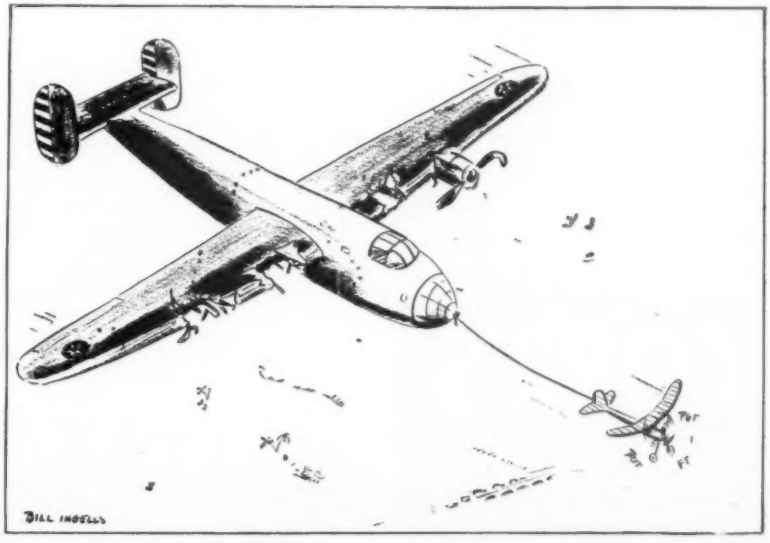
Following is a description of the planes in silhouette given above.

PLANE 15A—Gotha GO 145 twin place biplane used extensively for advance training in aerobatics and gunnery by Luftwaffe pilots. It is powered by a 240 hp. Argus As. 10C engine and is capable of about 140 mph. The GO 145 is all metal tubular construction with fabric covering. The most distinguishable features are its sweepback top wing, fixed landing gear and long slender fuselage. Wingspan is 29 ft. 6 ins.; length, 28 ft. 5 ins. Fully loaded the plane weighs 2,967 lb.; while empty it's but 1,918 lb. Rate of climb is set at 650 ft. per minute and the range at 414 miles. Service ceiling is 12,140 ft.

PLANE 15B—Messerchmitt Me 210A-1, long range fighter bomber developed from the well known Me-110. The new craft carries a crew of two, a pilot-bombardier and a radio-operator-rear gunner. Its features are two remote controlled "blister" guns for rearward firing and a new type dive brakes. Armament consists of two 7.9 mm. machine guns and two 20 mm. Mauser cannon, fixed in the nose; two 13 mm. machine guns mounted on the remote controlled swivel "blisters." Ample defensive armor is provided for both crew members. A maximum bomb load of 2,200 lb. is claimed. Powered with two Mercedes-Benz DB-601F-1 engines, the ship is capable of 385 mph. maximum speed. Gross weight is approximated at 21,300 lb. Wingspan is 53 ft. 9 in.; length, 40 ft. 3 in. Fuel capacity is 550 gallons.

PLANE 15C—Mitsubishi 97 dive bomber and torpedo plane. This ship is similar to our Douglas TBD-1. It carries a three man crew and is capable of 200 mph at 10,000 ft. altitude. Armament consists of one fixed forward gun and two flexible mounted rear guns. The power is one Mitsubishi Kinsei 4C engine. Wing span is 50 ft. 9 in.; length, 33 ft. 11 in. Fully loaded the ship weighs 8,500 lbs.

VICTORY



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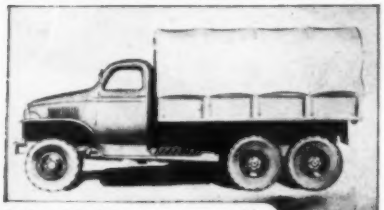

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AN30—BELL AIRACOBRA; P-39; complete **50c**
AN31—MESSERSCHMITT, 109-F; complete **50c**
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CORR'S

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Washington, D. C.

Cloud Coaster

(Continued from page 17)

the upper camber to shape, any excess length being taken from the rear. The last two or three ribs are square slabs of balsa glued in place and then sanded to shape.

Be sure slots for the spars are cut to the exact size, in order to prevent any tendency to warp when they are glued in place. The trailing edge *must* be notched so that it will always remain at the same angle with the ribs and keep the exact airfoil shape.

In assembling the wing the trailing edge must be raised about 3/16". Ribs are cemented in place between the leading and trailing edges, the spars added later. Spars are reinforced with 1/16" sheet balsa at each dihedral break. The center section is filled in between the ribs with 1/16" sheet balsa.

The wing edges are tapered and sanded smooth. The wing is covered with "rubber model" paper and doped to a high gloss finish.

RUDDER CONTROL: The towing control described here is essential to obtain the highest performance from your glider. Its operation is as follows: When the towline is pulled the tow hook moves forward slightly; this acts upon the control rod and the rudder tab, turning the tab to the straight flight position. When the towline is released the spring will return the hook, rod and tab to their original spiral flight position. Thus the ship can be set for a straight flight while being towed and yet have the much desired spiral in the glide.

The hook is cut from 0.63 brass and filed round on the edges. The frame can be cut from the same material or from slightly thinner brass. The shaft is .063 and the control rod .037 music wire. The stops, which control the extent of tab movement, are small nuts and bolts soldered between the sides of the frame. A small rubber-band may be used if a suitable spring is not available. It will be necessary to cut small holes in the bulkheads for the control rod to pass. The tab arm is of .063 M.W. and is glued to the tab after small bearings have been cemented to the stationary part of the rudder. The whole hook assembly is cemented inside the fuselage after a slot for the hook has been cut in the bottom.

FLYING: The wing is held in place on the fuselage by strands of rubber under the wing cover. The model is balanced by dropping pieces of lead through the opening for the wing into the space between the 1st and 2nd bulkheads. For final adjustments use B.B. shot. Don't be afraid to use plenty of lead; the model has almost 300 sq. in. of wing area and must weigh almost 9 oz. Once the ship is balanced there should not be any reason to add or remove weight. A little cement poured into the weight compartment will hold the weights in place. Further adjustments can be made by bending the stabilizer trailing edge up or down. But remember, a streamlined model is *very* sensitive to any adjustments made on the tail.

A.M.A. rules state that in towline glider contests the towline shall be no longer than 100 feet. It is advisable to use a 100 ft. line whether you intend to enter contests or not. Any strong string will do for a towline. However, for contest work, to get the most from your model, a good grade of light silk fishline should be used. (The thin fishline with its waxed surface will give much less resistance than a "fuzzy" string and will enable you to tow your model higher.) The line may be wound on a fish reel when not in use.

For your first test flight use the full 100 ft. of line. *Never*, when flying, leave the end of the line attached to the reel; it may at some time be necessary to let go of the towline to avoid damaging the model. Your assistant should hold the model with the towline on the hook and with the nose of the model pointing slightly upward. Have a prearranged signal with him so that, when you start to run, he will also run a few steps until the model rises out of his hand. If there is little or no wind it may be necessary to run fast at first. However, as soon as the model pulls strongly on the towline *slow up*. The ship climbs at almost right angles to the towline, like a kite, and the harder you pull the more you will strain the wing. Just keep enough tension on the line to keep the model climbing steadily. When it is almost overhead the line should be slackened so that the model will start to turn. A strong even pull in the direction in which the model is flying will send it around in a tight spiral upward, and the towline will drop off the hook. *Do not* jerk; if the line does not come off the hook when you want it to, let go of your end. Practice your launching technique to get the greatest possible altitude.

Remember, you won't break any propellers, wear out any batteries, or break any rubber motors when you're flying a towline glider.

VICTORY

Amazing Aerofacts

1. The Luftwaffe's Messerschmitt Me-109F, latest single seat service fighter, has a cambered airfoil vertical tail surface which gives a sidewise "lift" to counteract propeller torque, eliminating offset surface used on other planes.

2. A trans-continental airliner contacts the local station reporting its position, speed and weather conditions *seventy times* during the New York-Los Angeles trip. (Every 15 minutes!)

3. Two R.A.F. pilots recently figured that on their regular monthly pay prorated into hours and minutes, they received $1.70 for a trans-Atlantic ferry trip flying huge American-built bombers across the ocean. For this same trip, civilian pilots employed for the job got $500 with two trips a month guaranteed!

4. Parachutist Arthur Starnes' recent free-fall from 31,400 feet was just a hedgehop compared to the 60,613 foot fall of Captains Orvil A. Anderson and Albert W. Stevens in Nebraska in 1934. After their balloon had exploded nearly twelve miles in the stratosphere, their tiny sealed gondola plummeted earthward until at an altitude of less than three thousand feet the intrepid airmen leaped into space and floated to earth in their parachutes!

5. Recent experiments with "pick-a-back" airplane launchings are antedated twenty years by the flight of a Bristol

(Continued on page 64)

THE STORY OF WAR AVIATION

Can be Pictured with MEGOW Models

Kit No. C-3.....29c
SOPWITH (World War)

Kit No. C-2.....29c
SPAD (World War)

Kit No. C-4.....29c
NIEUPORT (World War)

It is a long way from the flimsy little crates of the first World War to the CORSAIRS, WILDCATS and LIGHTNINGS of today, and the development of aviation in these few short years presents one of the most interesting stories in all history. Only by the use of models can the story be fully understood.

Of the hundreds of Megow Models that have been produced, those marking the year-by-year progress of aviation have been retained. From little 10c solid models to the big "Lightning" Flying Model selling at $1.95 shown here, you can find practically any type you want... and for those wanting to answer America's call for Identification Models, there are some forty types of "Spotters' Specials" drawn according to Navy requirements.

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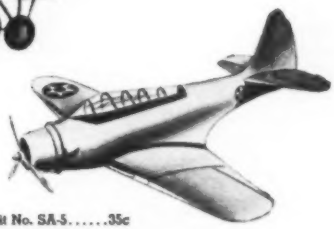

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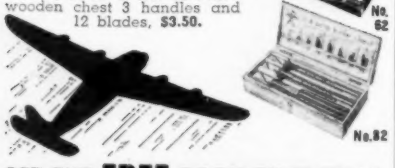

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Design Forum

(Continued from page 19)

To illustrate: David Jones, 300 Palos Road, Glencoe, Illinois, submits a design, A, he has dubbed "Aunt Jemima Special" because of its "pancake" design. The wing planform is approximately a square with an enclosure for a prone pilot in the leading edge and two propeller mounts with dual, 3-bladed co-axial propellers. The wing trailing edge is hinged to serve as elevators and conventional vertical surfaces project upward from the centerline of the airplane. He writes an interesting letter in which he states that his design is particularly suited for use on aircraft carriers in that it could take off in all directions irrespective of wind and could rise to battle enemy fighters while the carrier was turning into the wind to provide a takeoff for the heavier planes. We're afraid, Dave, that it would take *some* airplane to takeoff in 100 feet, even into a strong wind! He cites, in his letter, an airplane of similar design successfully flown by Cheston L. Eshelman which, the latter claims, was capable of a speed of 190 mph. It must be borne in mind that practically *any* combination of lifting surface and power can be made to fly. However, the problem before the aviation industry is to design an airplane that will fly *faster*, or *higher*, or lift a greater *load* or operate more *economically*. The design of such planes as the "pancake" type represents a basic conception that is entirely erroneous. One index to the efficiency of a wing is its "aspect ratio," a relation between the width and breadth. Aspect ratio has been defined as: $\frac{\text{Span}}{\text{Chord}}$ or $\frac{\text{Span}^2}{\text{Area}}$. The greater the aspect ratio the more efficient the wing; this "pancake" design has an aspect ratio of something like 1.00 or less!

When a wing is moving through the air, the wing tips cause the airflow to fold inward and downward in a corkscrew motion known as a "tip vortex." This vortex is quite large and exceedingly troublesome because it results in the airfoil moving through air which is being pushed downward. This effect is most noticeable, obviously, at the wing tips and lessens towards the wing roots. From this it follows that the greater the aspect ratio, the farther away from the great bulk of the lifting surface of the wing this tip loss will be. Now the "lift" of an airfoil is always "normal" (at right angles) to the relative wind and since the relative wind near the tips is moving downward, it follows that the lift must be at an angle. Since this lifting force is rearward as well as upward, this rearward component becomes, simply, a drag force. And this drag has been termed: "induced drag", since it is not an actual profile (parasitic or friction) drag but one resulting from the lift. It follows that the greater the aspect ratio, the smaller the induced drag and, therefore, the smaller the total drag. With an airfoil as represented by the "pancake" design with an aspect ratio of 1.00 or less it can be seen that the large amount of induced drag, coupled with the normal profile drag of the section, might easily make the total drag prohibitive and thereby render the design highly impractical. Conventional modern airplanes have an aspect ratio in the general region of 5.00-7.00 and much of the success of the famed Consolidated Liberator four-engine bomber may be attributed to its aspect ratio of 10.00!

There has been a number of "pancake" designs worked out for light airplanes where load-carrying capacity is not important. Such designs are adaptable to light airplanes because they have very high lift at landing angles. One thing may be said for them: at very small angles attained in normal level flight, efficiency is not as low as it might seem inasmuch as when the angle of attack is small the tip loss is small also. Such wings can be built comparatively light because of their short span. This design is often used to good effect in ships where low landing speed is desired.

Neil Presgler of Lodi, Cal., R. 1, Box 102, sends in a rather unique fighter design, shown in three-view B. This is probably one of the best forms of prone fighters that can be worked out, using twin booms and fins. In past Forum articles we have discussed other types, all of which have had some particular fault. This also has some faults but in choosing a design it is a matter of considering one whose faults you consider least important.

In this case we gain several advantages at a price. You will note that the engine is placed in the center nacelle. This provides superior maneuverability for the aircraft, compared to the P-38 type, for instance—where two engines are carried, one in each nacelle, a considerable distance from the center of gravity. Here the advantage of centralizing the weight is obtained.

A concentric counter-rotating propeller is also indicated. This is of advantage because it balances motor torque and the ship can be turned readily to right or left without gyroscopic reactions which induce tricky maneuvers.

The pusher type is excellent as it provides clear vision forward for the pilot who lies in a prone position.

A large hatch covering that bends up readily provides exit for the pilot in case he must parachute. However this type of ship makes such a procedure comparatively dangerous, for the pilot in leaving the cockpit is liable to be thrown into the propeller blades or struck by the boom or tail. The best arrangement would be a belly release, the pilot merely having to push a button and he would drop with the whole belly of the ship, free and clear into space.

Perhaps by this time readers may or may not have discovered the one fault inherent in this type of design. You will note that all the weight is concentrated in the center to obtain maneuverability; also the pusher effect enhances this condition. However this puts great stress on the wing centersection when landing, for landing shocks are taken by the wheels which are enclosed in the lower sides of the nacelle where they join the wing. This shock must be transmitted up through the wheels, horizontally through

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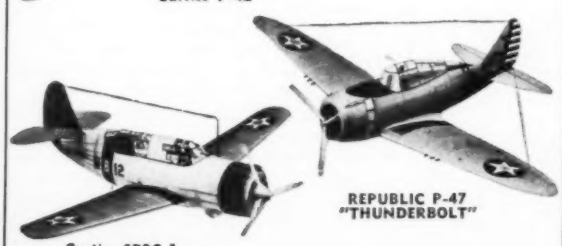

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the wing, to the supported weights.

A torsional effect is also produced by the reaction when on the ground between the nose wheel and the two rear wheels, the stress being transmitted from the nose wheel through the wing to the rear wheels.

This has been the problem facing the P-38 engineers, even though the center nacelle has been comparatively light. It has been necessary to make the wing centersection comparatively strong and heavy to take stresses developed. With the weight of the motor in the nacelle these stresses would be even greater in the case of this airplane.

There is a remedy for this however which was not shown in Presgler's original drawing but is indicated on the diagram by the dotted lines A. In other words, if the wing centersection is made very thick at the nacelle and tapered to normal wing crossection at the booms, great strength will be obtained—sufficient to carry the concentrated weights in the center nacelle. Though this centersection is comparatively thick it can be built quite light, because it is thickest at the nacelle, where bending moments are greatest.

Also drag is reduced considerably because this thick centersection has the effect of a fillet. Drag is reduced where the wing joins the nacelle because the air is not pocketed between the wing and nacelle surfaces joined at abrupt angles when thin wings are used. The reduced drag due to better streamlining and the more uniform airflow resulting far outweighs the slight weight increase necessary to build this thicker section.

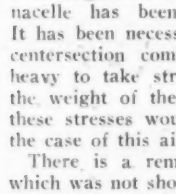
The rest of the design including the taper wings, twin fin and general proportions, is excellent. With the thicker tapered wing centersection this design could be made superior to anything now in the air.

Joe Gallant, 56 Huban Court, Roxbury, Massachusetts, sends in design C from which he has built an excellent model. The airplane consists of twin booms in each of which a motor and propeller are mounted, twin vertical surfaces interconnected by a single horizontal surface and a retractable landing gear. A cockpit, fully enclosed, is provided in each boom. The purpose of this design is not quite clear as it seems to have two pilots and nothing else. We can imagine some terrific arguments that might ensue in such an airplane, or perhaps it was designed to dispense with the "back-seat" driver by putting them both up in front! One application that might prove satisfactory is an advanced trainer, with the student in one cockpit and the instructor in another and the sensation would not be unlike flying solo.

VICTORY

CORRECTION

We wish to thank all our readers who brought to our attention the erroneous caption for the center picture, page 7, July issue. This plane is a Zero, not the Vanguard. Sorry!



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Frontiers

(Continued from page 20)

pictures, page 20 is shown their version of the Wildcat aboard the carrier Illustrious.

The former shows one being wheeled into position for takeoff, the latter shows how fast it gets into the air: it is off the deck long before the end of the runway. Note the partially deflected flaps on the trailing edge—increasing lift to reduce run. Note also the unique feature of all Grummans; retractable landing gear that folds into the body instead of the wings.

Another outstanding characteristic of these Grummans, puzzling to those familiar with aerodynamics, is the square wing tips. This because science teaches that elliptical wing tips are more efficient. But on a combat plane there is an aerodynamic, structural or tactical reason for everything. In this case it is tactical because elliptic-tip planes would naturally take up more space, reducing storage capacity. Square tips can be designed to reduce loss of efficiency to a negligible degree compared with advantage of increased striking power of the carrier.

The asbestos-suited sailor on the left is a specialist fighter against the greatest foe any navy has to combat outside the enemy; the cruel God of Fire. When battle-damaged planes limp home landings are extremely dangerous because of collision and fire, and it is gratifying to pilots to know that a detail of these strange-looking, courageous seamen stand by to drag him out of flaming wreckage.

The Typhoon, Britain's latest fighter, is considered the world's speediest, displacing the Spitfire and possibly the Thunderbolt. Though its time is still a military secret, it has proved to all who have seen it perform that it has terrific diving power and can maneuver with anything the Nazi's have in the air. Top picture on page 21 shows its peculiarly shaped nose, odd because of the gaping air vent under the prop spinner. Air forced into this opening cools the engine in a divided stream part of which contacts a prestone radiator and the rest an oil radiator. Four 20-mm. cannon have been making German pilots take to their parachutes—but only the lucky ones—the use of explosive shells fired from these guns usually blow the enemy apart. The picture on the right shows the Typhoon "revving" up and it also shows you its guns, giving you an idea of what the heaviest-armed fighter in the war looks like.

The second picture on the left shows a Jap's-eye view, when he attempts to attack from the rear, of the stinger on the tail of a Consolidated (Liberator) bomber. He sees two .50-calibre machine guns darting poison at him.

The guns are contained in a revolving turret which might make a student of aerodynamics wonder at its shape. He might well argue that its awkward modeling should be streamlined to reduce drag, that it should be elongated to a point aft to blend smoothly with the fuselage. And he would argue well if it wasn't for the fact that the entire turret swivels. If streamlined and swung to the right for instance, it would have the effect and action of a rudder; that is, if the turret were swung to the right the ship would turn to the left, a maneuver to which even the most affable

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pilot would object, especially if at the moment he had ideas about turning to the right to avoid a Zero who was trying to tattoo his windshield. Its carefully calculated shape is designed to keep its movement from affecting the plane's controls.

North American Aviation should be justly proud of its famed Mustang with which the British have reduced so many European locomotives to the dubious value of scrap for Nazi blast furnaces. And this company may well take increased pride in its inspired efforts to produce a dive bomber stemming from the same design.

Three of these fastest dive bombers, designated A-36, are seen in the second picture in the right hand column. These more than 400 mph planes will do more than their share in the coming invasion of the continent and the roll-back in the Pacific. This essential design is probably the most versatile ever produced, giving superlative performance in several categories such as pursuit, ground strafing, dive bombing, and even pinch hitting for medium bombers.

The interesting Fairchild 21, constructed throughout of plastic-bonded plywood, is shown second from bottom on the left. It is a 200 mph five-seater conceived primarily to train air combat teams in the greatest essential, as their name implies, teamwork. Wooden construction has the strategic advantage of saving scarce metal beside having inherent advantages such as lightness, strength, ability to withstand temperature changes, and finally wood is easy to work—which means fast production. It is a smooth job.

News flashes from the air fronts often mention the Lockheed Vega Ventura, second from bottom, right. It is as long on performance as its name and the latest brawny youngster of the Lockheed family, sired by the renowned Hudson, which in turn was the offspring of the familiar Lodestar Transport. The Ventura is a reconnaissance bomber, top speed 270 mph, deviating chiefly from the Hudson by the bulge in the fuselage aft arc, containing a gun for protection to the rear and below. The top turret is similar to the older Hudson.

For size and load capacity this latest Lockheed is quite fast, speed due to the fact that it can take high wing load and at the same time land relatively slowly by the use of Fowler flaps. Fowler flaps extend rearward which increase wing area, and curvature in increased lift and loss of speed.

Few closeup photos of Nipponese bombers have been taken because the secretive Japanese guarded jealously from other powers the fact that they had developed some very efficient planes. The past tense is used because today they have none comparable with the U. S. types. The bottom picture, left, reveals three twin-engine naval planes that display excellent aerodynamic characteristics.

One feature the Japs borrowed from the Junkers design is the depressed flap consisting of an auxiliary airfoil hinged to and below the wing trailing edge which operates as aileron as well as landing flap. Incidentally, this bomber was developed from the Japanese round-the-world goodwill plane, a fact revealing how easy it is for the Japs to make the swift transition from goodwill to treachery.

The British Hampden bomber is shown, bottom right, waiting for its share of parachute bombs, bombs so deadly they destroy all life within a radius of an eighth-of-a-mile surrounding contact. The parachutes are used to reduce bomb penetration in some instances, in others to slow the fall so that the discharging plane has time to get away from the wide-area explosive effect of its own missiles.

VICTORY

Building Scale Model Planes

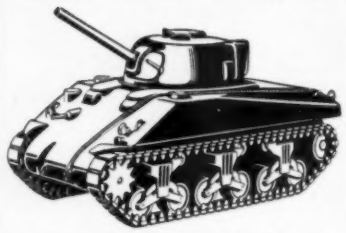
(Continued from page 8)

as a consequence building time was considerably reduced on the Pratt and Whitney.

The cockpit in this model contains about 80 instruments and controls; more could be said about these, but all we can say is: "get your information and start packing it in the cockpit." Be careful to get the details clean and precise—that is as important as getting the details. On all the instruments made be careful to get the numerals on the dials legible and see that the needles have the proper colored tips. Also, the safe margins for operating the plane are indicated on the dials; these are usually red or yellow stop marks or "Do not exceed" marks. Ship data cards, compass and altimeter correction cards are also included among the details.

This plane's fuselage was first built up with formers and stringers, then each opening was filled in by inlaying wood about 1/16" thick. This model also has a retractable landing gear.

Scale Model Builders



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This model also won first place; the Hotel Statler Trophy, donated by the Hotel Statler, Detroit, in 1941, receiving 63 out of 65 possible points. It has not been entered in any other contests.

Having won the equivalent of the city and state championship two consecutive years we decided to retire from local competition, but at an outdoor meet were challenged by several older builders and told to "look to your laurels," because they were going to take our "crown" away. We couldn't resist their challenge—and so another model was born.

This was the Bell P-39 Airacobra—built under a great deal of pressure. The contest was to be held in January of 1942 and we started building the model November 1, 1941; putting in about 550 hours on the model after working all day and going to school at night. Too much concentrated work takes a model out of the Hobby class! This model was not built from a commercial kit because the details to be included would have to be built into the plane and not "stuffed in" afterwards.

The motor, an Allison 1710 C, required about 110 hours. Manifolding on this motor is particularly intricate, especially in 1" scale. Some of the details include: the magnetos, starter, supercharger, carburetor, spark plugs and spark plug cooling pipes. The nuts and bolts were also filed from pins; magnetos have the twisted wires to keep bolts from becoming loose. The motor also has the prestone expansion tank and cooling unit. This unit is under the motor and is complete even to retractable air vent. Radiator core has the lead-in and out pipes necessary for fluid circulation; these are connected directly to motor cylinder block cooling jackets. On each side of the prestone radiator are oil coolers, also connected to the motor.

In building this model plane we learned more about scale and proportion than at any other time; if a part was too big it wouldn't fit and if too small we knew it was out of scale. In other words, the 'Cobra is about the most compact plane we have ever seen.

The fuselage had to be built like the real plane so that details could be made to work. The two main frame lines were set up, then the floor installed, next the cabin with instruments and controls (over 100 of them), then the motor with its drive shaft. From there we worked forward, backward, and to both sides.

The cockpit was perhaps the most interesting yet worked on. The instrument panel came out of the usual model class because the dials were backed up with the cases, and the necessary wiring and tubing for each instrument was included. The machine gun sight is the Army accepted electrical type and in front of that can be seen the 2-1/2" bullet proof glass. Panel at the top is the flight panel; the middle one, the motor panel; the bottom one, the radio panel. This model is the only one we know of that has the pilot's relief tube included among the cockpit details. All controls are movable including fuel wobble pump, door handles and arm rest. In the right-side door are maps necessary for a "joy ride" around the Michigan area. Doors are removable the same as on the real plane; also the outer door handles are retractable. All aileron, rudder, and elevator trim tab controls are on the left side of the pilot's seat. The throttle control is connected directly to the motor.

For the landing gear, there are nine individual doors that open to let the wheels drop into position for landing. This presents a problem in locking-in position, but was solved by using a key pin to hold the gear steady. The brake drums have the hydraulic oil lines connected to an oil chamber in the plane.

The landing flaps are manually operated and really quite simple to construct. They drop down and raise up—nothing to it.

Lights were at first a problem but easily overcome when the bulb was placed in the center of the wings and vertical stabilizer and place-colored plastic lenses on each side to show the light. Batteries are placed in the wings.

Cannon and gun barrels are included but none of the breech mechanisms, due to request not to duplicate any of these parts or mountings. Remember, this was in the early fall and winter of 1941, before we were at war, and though now pictures of these parts are often seen, we were grateful for the information obtained at that time. For this model we used over 200 pictures and made about 75 drawings of parts and assemblies.

The paint is U.S. Army Air Corps olive drab and the fuselage sides are sprayed a flat burnt amber to represent the exhaust burns found on the prototype.

The judges awarded the plane a perfect score. This was in the Detroit Free Press and Detroit Department of Recreation Contest in 1942. The model won first place in the Open Replica Event and also the Grand Championship for all events.

We had hopes of a 1942 national scale model prize of some sort, but of course there was no contest, so today the model gathers dust waiting for someone to buy it—providing, of course, we know they will take care of it.

Now a bit about how contests can be prepared for, so builders can be reasonably sure of a prize:

Most scale model builders seem unaware of the value of having accurate detail in and around the cockpit, cabin and motor. There is no secret to the fact that real detail is centered around these two places.

Another point that might be mentioned: when selecting a model for competition try to place a value on "eye appeal." This is a broad subject, but it may be defined best as a model that seems to stand out among others at first glance, both through workmanship and quality of design.

Camouflaged planes are definitely not in this class, as for the most part they look just as the word intends them to, and messy.

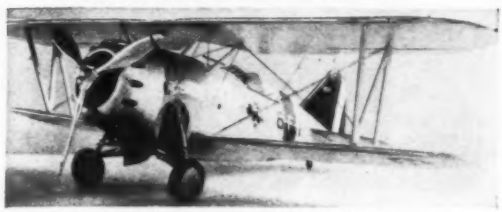
The scale of the model is quite important: it may be a beautiful piece of craftsmanship, but the smaller the model, the harder it is for judges to pick out the details. Consequently they are lost.

Most planes can be built to a 1" scale. This offers more latitude for the accuracy of detail.

(Continued on page 44)

GRUMMAN F3F1

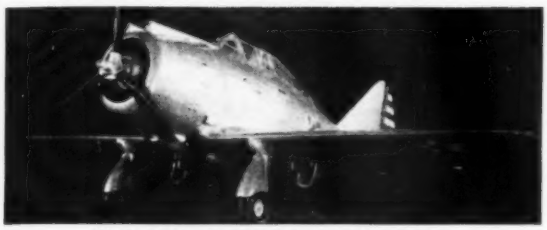
U. S. NAVY SHIPBOARD FIGHTER



32" Span. Length 24". 1" Scale

A fine detailed model with retractable landing gear, 4" turned motor front, 3 oz. grey dope, ½ oz. yellow, 2 oz. glue etc., all parts printed, 10" propeller, wheels, full size drawing, and all parts. This fighter plane is used in large numbers on the aircraft carriers. Const. Set complete, postpaid..... **$3.75**

SEVERSKY P35A ARMY PURSUIT



32" Span. Length 25". 1" Scale. Color, Silver

Set has 4" turned motor front, 10" carved prop, wheels, tail wheel, all parts printed, 3 oz. silver dope, ½ oz. black, 2 oz. glue, etc., insignia, and full size scale drawing. New improved model has retractable landing gear and movable controls from cockpit. Set, postpaid..... **$3.25**

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THE MOST SENSATIONAL EXCLUSIVE BOMBER SET IN THE WORLD

Set has all parts printed, four 2" special finished motor fronts, four carved props, wheels, set of paints, glue, and full size drawing. Set, postpaid **$4.50**

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THE MOST EXCLUSIVE AND FINEST EQUIPPED MODEL IN THE WORLD. MOVEABLE CONTROLS WORK FROM COCKPIT. A special de luxe model, one of the most beautiful ever made. Set contains a 4½" scale Wright Cyclone celluloid motor, detailed push rods, fins, etc., like real motor, 4½" aluminum cowl, 10" steel type carved prop shown, 2¼" wheels, tail wheel, star and rudder insignia and lettering, windshield, instrument board, flying wires, 4 aluminum step plates, aluminum wing walks, ready cut wheel pants, washers, 3 oz. grey paint, ½ oz. yellow, ½ oz. red, 2 oz. glue, etc. All other parts are printed 33"x44" scale drawing. Const. set, complete in labeled box, postpaid..... **$4.50**

NEW MARTIN B26 U. S. ARMY BOMBER

40" Span. Length 35". ⅝" Scale. Color Silver

A beautiful model of the world's fastest bomber. Set has all parts printed, propellers, wheels, insignia, 4 oz. silver paint, 1 oz. black, motor fronts full size scale drawing, and all parts to build. Construction set, postpaid..... **$4.75**

Thousands of this type of plane are fighting for the U. S. and Britain

MINIATURE AIRCRAFT CORP.

83 DANIEL LOW TERRACE
STATEN ISLAND, N. Y.

Last of the Dive Bomber?

(Continued from page 7)

Tripolitania and into Tunisia his fighter protection was broken by additional Lockheed Lightnings and the Stuka was withdrawn. The fall of Tunis and the liberation of North Africa may have sounded the death-knell of the dive-bomber as a military weapon.

Few nations believe in air power more fervently or are more highly respected in terms of aerial warfare than is Great Britain and, therefore, her attitude on the dive bomber as a military weapon, is of considerable interest. Great Britain has not developed a dive bomber of native design and construction and she has used few of them, none on a major scale for the simple and obvious reason that the High Command of the Royal Air Force does not believe that the type holds any tactical advantage. There are only two dive bombers in service with the R.A.F., both are of American design and construction: the Vultee Vengeance and the Brewster Buccaneer. The Vengeance was designed and built to a British specification which was issued to several American firms. The Vengeance, of which a considerable quantity has been and is being built, has been used by the British in India and is now in service with the Army Air Forces as the A-31. The Buccaneer has been a miserable failure from its inception, all not entirely due to its specifications but rather to enormous delays in design and construction. The Buccaneer has seen service with the Royal Navy but that it has been a disappointment is seen by its mention in several debates in the House of Commons as a fiasco of Governmental planning and spending.

Here at home we have had success with but a single type: the Douglas Dauntless, actually a semi-modernized development of an earlier Northrop design, the BT-1 and 2. The Curtiss Helldiver SB2C-1 has not been tried in action and cannot, therefore, be judged accurately.

Ground defense has placed the dive bomber at the cross-roads. The murderous hail of high-velocity shells thrown at the Stukas in North Africa helped to drive it from the skies and such ground defenses will most certainly end the dive bombers period in aerial history. The perfection of the 20 mm. antiaircraft cannon, including its present high rate-of-fire, high muzzle velocity and astounding accuracy has driven the dive bomber from the skies. Mounted in reciprocating pairs, or in fours as in the famed British Bofors, these guns have smashed the invincibility myth of the Stuka. The American .50-caliber machinegun added to the wicked 40 mm. cannon, played a vital role in Tunisia and rendered impotent the diving attacks.

Certainly the dive bomber, due to its tactical requirements, is the most vulner-

(Continued on page 44)

Building Scale Model Planes

(Continued from page 42)

After the model has been selected it is a primary requirement that the builder spend quite some time in research to obtain photographs and drawings of the plane to be built. The more of these that are on file the better chance one has of checking the accuracy of a detail.

Pictures of cockpits are particularly hard to find, especially if the model is a military plane. However, certain planes' interiors have been published and they will "clear the fog" to some degree when constructing this part of the plane.

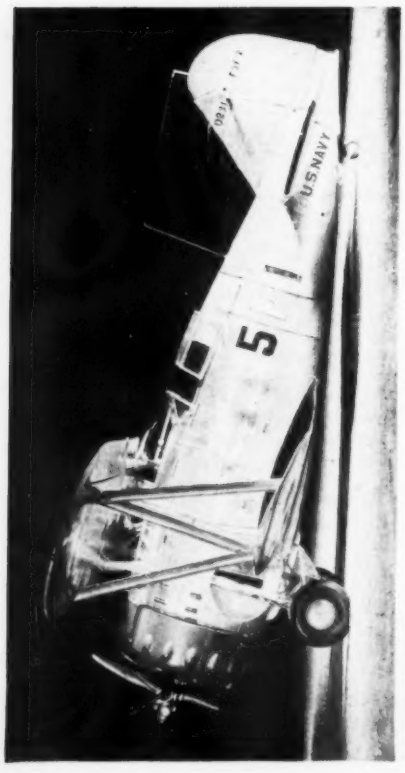
Fortunately, photographs of motors and their dimensions are available to the builder in annual editions of several reliable aviation magazines. Pay particular attention to the motor detail. Take at least a month to build it and notice the difference between a motor hurriedly constructed and one constructed with some forethought.

Retractable landing gears, removable inspection plates, movable controls, sliding cockpit covers and all the other working parts that can be successfully operated are important when the model is being judged. Too often these are forgotten by the builder.

Before entering a contest, it is a good idea to do a bit of preliminary judging. Place the model on a table or workbench and have two or three people judge the model. Let them be critical. Then analyze their decision and, if time permits, correct the faults.

Remember, time and the desire to produce perfect detail are the first requirements of fine replica model building.

VICTORY



Last of the Dive Bomber?

(Continued from page 43)

able unit of air power; it must operate in the very mouth of these powerful ground guns. Accuracy demands that the dive bomber release its bombs at 2,000 ft. or less, and accuracy is the raison d'etre for the type. And 2,000 ft. is the prime accuracy region of the ground defenses.

The dive bomber requires an especially strong structure and high load factors mean high gross weight with its inevitable cost in performance. It is impractical to build a dive bomber with high performance, this characteristic would be wasteful because of the single, specialized purpose of the type. The dive bomber is essentially a "one-shot" airplane as it has but *one* bomb to deliver at *one* place at *one* time. Should that one shot miss, the entire cost of the maneuver has been wasted and its vulnerability as an added detriment makes the cost prohibitive.

Dive bombers require highly-skilled personnel for their operation for several reasons. Their crews must withstand considerable punishment in the form of high accelerations with damaging effects on nervous systems, functional disorders of the eyes, ears, lungs and cardiac muscles. The pilot requires extensive training over a period much in excess of that required of a fighter or bomber pilot and is therefore a much more costly man. His skill alone determines the success of his mission and he has few mechanical devices to aid him. The point at which he enters his dive, angle of dive, instant of pull-out and release of the bomb are entirely up to his good judgment, training and experience; he has no fabulously accurate bombsights, no accurate estimates of speed, altitude or drift. His is a one-man show!

In an analysis of high-level, horizontal bombing as compared to dive-bombing, let us examine carefully, the pure mathematics of the comparative ballistics involved. It will be necessary to consider only the conventional 1,000 lb. general purpose bomb, as dive bombers do not carry 2,000 lb. demolition bombs or the pulverizing 4,000 "block-buster" and most certainly not the unbelievable 8,000 "super-block-buster" which weighs more than a dive bomber fully loaded!

Dr. Ing. C. Kaysing, in his treatise "Untersuchung Uber Den Geschwindigkeit von Flugzeug Bomben" sets forth the following relationship between the terminal velocity (V_t) and the striking velocity (v) of a bomb dropped in steady level flight:

$$v = V_t \tanh \frac{gt}{V_t}$$

The terminal velocity of a bomb is given by the formula:

$$D = C_D \frac{p}{2} sV^2$$

A general purpose 1,000 lb. bomb, M-65, (actual weight 1065) has a diameter of 18.8" and a crossectional area of 277.6 sq. in., or s=1.9 sq. ft. D=total drag. Using a drag coefficient (C_D) of .175, and ½P being .001189 (air density), we substitute, solving for V:

(Continued on page 46)

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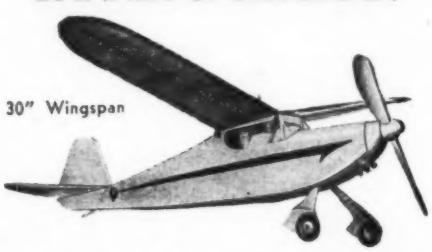

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24" Wingspan

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Each kit contains cut-to-outline shape fuselage, wings (tapered trailing and leading edges where necessary!) nacelles, stabs and rudder; Material to make propeller, wheel pants where required. Turned wheels, Insignia, Cement, Base Paint, Celluloid for cockpit enclosure, Aluminum cowls where specified on plans. DELUXE KITS contain FULLY CARVED-TO-SHAPE FUSELAGE in place of cut-to-outline fuselage. Kits are identical in all other respects!

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Accessory Kits $1.00 Foil paper, brush, cement, insignias, colors, sandpaper and stylus for rivet detail incl. instructions.

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Flash News

(Continued from page 2)

Boulder Dam. Purpose of the flight was to secure C.A.A. approval of extensive reworking on the ship prior to turning it over to the U.S. Army Engineering Corps. Coming in for the landing, the craft suddenly went out of control and plunged into the waters taking the life of William M. Cline and injuring the others who swam to a collapsible life boat and were later rescued. Hughes is presently engaged in construction of the mammoth Kaiser-Hughes cargo plane, which is to be the largest thing ever built. It is scheduled for completion.

According to Lend-Lease Administrator Edward R. Stettinius, Jr. the United States has sent Russia "several thousand" planes. The cargoes were carried mostly across the North Sea route to Murmansk, but additional routes have been opened through the Persian Gulf; the collapse of the Axis armies in North Africa has also opened the Mediterranean.

Some index to the tactics employed by the United Nations in their air attacks on Sicily is gained from a recent announcement of a raid on the island stronghold which completely wiped out the city of Marsala, on the Western Sicilian coast and left the entire dock area of Catania afire. Fifty Liberators took off from a North African port, swung out over the Mediterranean in a wide arc, picked up an escort of 100 Spitfires from the island of Malta and the giant armada droned towards Sicily. Certainly no Luftwaffe force dares move against such a formidable force and such tactics are opening the way for invasion.

On April 1st, 1943, The Royal Air Force celebrated its twenty-fifth anniversary with little or no ceremony. Reorganized out of the Royal Flying Corps, the R.A.F. was hard at work on April 1st, 1918, and now, 25 years later, it is again hard at work. And we should like to pay tribute, in our own small way, to the R.A.F. and its valiant crew of officers and men, and add our voice to the great round of applause which circled the earth on that day. The Royal Air Force has changed the course of history, let none of us deny this, and to this small group of courageous flying men goes the free world's gratitude. When, in the Spring of 1940, the British Expeditionary Force was cornered in Northern France and Belgium, Democracy saw its gravest hour, an hour which was to continue through the miraculous evacuation and through the long, watchful, pregnant, fear-laden days and

(Continued on page 48)

Last of the Dive Bomber?

(Continued from page 44)

$$V = \sqrt{\frac{1065}{(.175)\ (.001189)\ (1.9)}} = 1640 \text{ f.s.}$$

Substituting in the Kaysing formula:

$$t = \frac{V_t}{g} \cosh^{-1} e^{\frac{gS}{V_t^2}}$$

$$= \frac{1640}{32.2} \cosh^{-1} e^{\frac{(32.2)\ (20{,}000)}{1640^2}}$$

$$= \frac{1640}{32.2} \cosh^{-1} e^{.24}$$

$$= \frac{820}{32.2}$$

$$= 25.4 \text{ seconds}$$

(S = displacement or distance. Now, substituting this value of t in the first formula:

$$v = 1640 \tanh \frac{(32.2)\ (25.4)}{1640}$$

$$= 1640 \tanh .5$$

$$= (1640)\ (.462)$$

$$= 755 \text{ ft. per second (approx.)}$$

Thus, we now know that a 1065 lb. bomb dropped from 20,000 ft. takes 25.4 sec. to strike the target with an impact velocity of 755 f.p.s.

Prime factor in aircraft bomb analysis is the "hitting power" or kinetic energy which drives the bomb into the target prior to the explosion. Since a bomb lying on the ground, touched off by an electric current does little damage, it follows that destructiveness is actually a function of penetration or kinetic energy which is, simply:

$$\text{K.E.} = \frac{mv^2}{2}$$, in which m represents mass (weight divided by 32.2, the acceleration of gravity) and v represents velocity. From the formula it is evident that doubling the mass only doubles the kinetic energy, whereas doubling the velocity quadruples the striking power!

The dive bomber normally releases its bomb at about 2,000 ft. and at a constant speed of 250-300 mph maintained through the use of "dive brakes," lattice-like structures projected out of the upper and lower surfaces of the wing normal to the slipstream. The bomb which has an initial velocity of 367 f.p.s. (speed of the plane) will pick up 151.6 f.p.s. before it strikes giving it an impact velocity of 518.6 f.p.s.

We now have the impact velocities of both the high-level horizontal bomb and the dive bomb and can now compare their respective kinetic energies.

(1) High Level Bomb:

$$\text{K.E.} = \frac{1}{2} mv^2 = \frac{1}{2}\left(\frac{1065}{32.2}\right)(755)^2 =$$

9,400,000 f.p.

(2) Dive Bomb:

$$\text{K.E.} = \frac{1}{2} mv^2 = \frac{1}{2}\left(\frac{1065}{32.2}\right)(518.6)^2 =$$

4,400,000 f.p.

Thus, quite obviously, the high level bomb has more than *twice* the destructive power upon impact as the dive bomb. Certainly the dive bomber cannot be com-

pared with the high-level horizontal bomber in terms of sheer hitting power and the horizontal bomber will normally carry six or eight of these bombs, giving it an actual 16-to-1 ratio of destruction to the dive bomber.

The horizontal bomber as represented by the modern Fortress, Liberator, Lancaster, Stirling and Halifax, has an effective range, dependent upon bomb load, of several thousand miles, giving it great flexibility of operation over distant targets far beyond the reach of the dive bomber's short 300-500 miles limit.

The outstanding success of the American .50-caliber machine gun mounted in both power-driven and hand-operated implacements, particularly on the Fortress, has made the bomber self-sufficient in action and the vast majority of raids are now being carried out without fighter protection whereas the dive bomber is incapable of extended operation in fighter-defended enemy zones without such convoy protection.

Chief advantage of the dive bomber heretofore has been its comparatively great accuracy, trained bomber pilots being renowned for their ability to "lay 'em on the nose." The accuracy of the dive bomber has been shattered by the tremendous increase in efficient ground defense weapons forcing the dive bomber higher, so destroying its accuracy factor. Conversely, the development of high altitude bomb-sights, the amazing skill now being exhibited by bombardiers and the comparative safety of the high altitudes has made the horizontal bomber a vastly more effective weapon and the accuracy of high-level horizontal bombing has increased 300%, according to a recent estimate by Major General Jimmy Doolittle, Commanding Officer of the North African Bombardment Operations.

Ground attack, originated and developed by the United States Army Air Forces, has, in the main, absorbed the duties of the dive bomber. The perfection of wing-mounted 20 mm. cannon installations, first achieved by the Royal Air Force and now used by the U.S. Army Air Forces, developed a ground-air cooperation which smashed the enemy on every front. Low-flying fighter planes, whose 400-mile-per hour top speed makes them but phantoms in the gun-sight of ground defenses, have done more damage to enemy troops, tanks, motorized vehicles and trains than ten times as many dive bombers might have done. North American Mustangs, adapted for the purpose, have been used extensively as locomotive destroyers and as many as seven trains have been wrecked in a single sortie (one plane on a single flight.) The British smashed Rommel's African legions with a "secret weapon," now revealed as Hawker Hurricanes equipped with two 40 mm. cannons mounted at a —5° angle in the wings. With these fast-flying terrors sweeping the roads of El Alamein, Benghasi, Tobruk and Tripoli with murderous streams of high-explosive shells, General Montgomery streaked ahead almost without resistance.

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tack, and the falling of a single bomb in a single area cannot, most assuredly, be compared with the venomous 600 rounds-per-minute streams of high-explosive shells covering hundreds of yards of crowded enemy transportation. Darting and weaving back and forth along a jammed road, the ground attack fighter is nearly invulnerable to ground fire but is fearfully destructive to enemy men, materials and morale.

And on the sea the picture has changed. A single U.S. Navy battleship of the new 40,000 ton type, destroyed no less than 80 Japanese dive bombers and other types in the South Pacific with its powerful deck batteries of A-A shell-guns. On the sea the dive bomber has had its greatest fame in the destruction of battleships, cruisers and destroyers, too numerous to detail here. But powerful Bofors and American shell-guns, mounted "pom-pom" fashion on ships of the fleet, have sounded the death-knell of the dive bomber.

Operating against defenseless peoples, Hitler's dive bombers achieved infamy at a time when armies were disorganized, untrained and poorly equipped to meet them. Hirohito's dive bombers dealt the United States Pacific Fleet a near-fatal blow on that black December 7th Sunday morning, again against no opposition. But the enemies of the Axis have grown from children into men, from frantically mustered civilian hordes to well-trained, well-equipped armies who have whipped the dive bomber in North Africa, in England and soon throughout the world.

High altitude precision bombing has all but replaced the uneconomic dive bomber for strategic missions; the ground-hugging, cannon-equipped fighter has replaced the dive bomber for tactical cooperation use. The world's peoples need no longer live in dread of the high-pitched wail and subsequent crash of bombs that told the tale of the dive bombers' attack. Once again, Hitler has played a loser!

VICTORY

Dual Purpose Hand-Launch Glider

(Continued from page 34)

izer with two coats of cement, making certain the wing and stabilizer are parallel. Finally put two coats of thin cement on the leading edges and tips of the wing and stabilizer to prevent them being nicked.

FLYING: Place enough clay on the nose until it balances about 2-1/4" from the leading edge, and make tests until a smooth left circle is obtained. A circling flight is essential for a soaring flight. Warp the rear of the stabilizer down to prevent stalling and remove clay to prevent diving. The rudder is warped to circle the glider. When the final adjustment is made the trailing edge of the right wing is warped down a little. Now throw it straight up. If it does not level off into a smooth left circle, adjust the glider for a smaller circle by warping the right wing more. The best time to adjust this glider is in calm weather.

Do not fly this model on windy days, as it is very light and will not stand being knocked about. If you follow these instructions and plans very carefully you should have no trouble in duplicating the performance of this glider. Try your luck.

VICTORY

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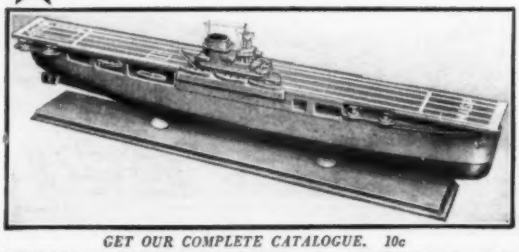

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Flash News

(Continued from page 46)

nights to come. Hitler's Wermacht had not been stopped and from Paris he eyed London with more than just a greedy eye; with a confident, certain gaze. With invasion almost a foregone conclusion, England and the free nations of the world waited. Only 30 miles of water separated Democracy from Armageddon and then the attack came: from the skies. With less than 5,000 first-line combat planes, the Royal Air Force took wing to battle the Luftwaffe's 50,000 planes. The story of the Battle of Britain has been too oft and too well told to bear repeating here but had not that wonderful little band of fuzzy-cheeked youths fought off the serpent of Naziism, America today might well be manacled under the Nazi swastika. October of 1940 found the worst of it over and Churchill had delivered his immortal phrase: "Never in the field of human conflict was so much owed by so many to so few." Then North Africa, where the expanded and refreshed R.A.F. battled Rommel 1,300 miles across the desert and into the face of a rising United States Army Air Force. The R.A.F. outnumbered the A.A.F. two-to-one in North Africa and, once again, played a major role in history. Today the Royal Air Force Bomber Command is opening the invasion of Feistung Europa with a smashing blanket of bombs. Only one-plane-in-ten over Europe today is an Army Air Forces plane. Again, the R.A.F. is writing history. Certainly American Air Power is pouring into the European theatre and Sir Arthur Harris has frankly admitted that the great armada to smash the Nazi in Europe must eventually come from America. The day of tribute to our own Army Air Forces is coming; but let us do homage to the Royal Air Force, who has carried the torch of liberty high for 25 years and who will soon hand it to the A.A.F. May our American men carry it as proudly and as high!

Success is finally coming to the Allies in their battle against the U-Boat and particularly America's efforts in the North Atlantic and along our Eastern seaboard. Several factors have combined to make this good news possible. Nazi construction has fallen off sharply due to repeated effective raids on the pens along the German northern coast and the coasts of occupied France, Belgium and the Netherlands. Although heavily fortified under tons of almost inpenetrable concrete, bombers of the A.A.F. and R.A.F. Bomber Commands have done irreparable damage to U-boat construction. On the high seas aircraft are beginning to take their toll and it has been announced that a string of escort carriers are now being maintained across the North Atlantic, affording constant aerial patrol across the whole of the convoy route to England and the North Sea. The German High Command announced that sinkings in March totalled 850,000 tons; in April, 415,000 tons, and in May only 372,000 tons. That these losses have been cut in half in a three-months' period indicates either the use of some new weapon or falling off of U-Boat activity—or both.

Release of information concerning one of the war's most carefully guarded secrets has been a surprise move by the Army and Navy. Radar, one of the most confidential

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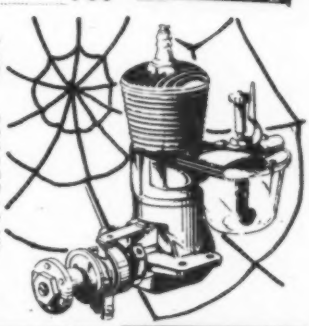

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"secret weapons" used in this war, can now be described, briefly, although details are still a more or less secret. Reason for the move apparently is the High Command's admission that the enemy now has its own design of this device in operation and manufacture and therefore it need no longer be kept private. Radar, which means Radio Detection and Ranging, means about what it says: it is a device for detection of hostile craft during periods of darkness and computation of the object's distance from the apparatus. It consists, essentially, of a stream of electrons which, upon striking an object, are deflected back in a straight line to the point of reception. Here it is received and the elapsed time between transmission and reception constitutes the range insofar as the electronic stream travels at a known speed. Enemy airplanes can thus be located in the blackest of night, as can enemy ships, tanks, etc., without previous sight, sound or knowledge of them. The device is carried aboard night fighters, ships at sea, land stations, and various other listening posts which find use for such mechanism. The device actually originated with the British and was in use in their night fighters during the Battle of Britain which probably accounts, in no small measure, for the success of that engagement. The United States has developed it and it is now in use on our airplanes, ships and listening posts.

Max Constant, renown racing and test pilot, has been killed in the crash of a secret Northrop flying-wing test ship, it is revealed. Cause of the crash was not determined as it fell several miles from the test field and no one saw or noticed the airplane in trouble. Company and Army officials are investigating, however. Constant may be remembered as the pilot of the Bellanca tri-motor racer in the Bendix transcontinental race and also as pilot of Jacqueline Cochrane's Beechcraft in the New York-to-Miami race which he won in 5 hours, 43 minutes.

When the true story of the Civil Air Patrol has been told a valiant chapter in America's aviation history will have been written. This group of fliers takes time off from their jobs, use their own planes and fly coastal patrols unceasingly without pay and virtually without recognition or credit by the armed forces. Only their gasoline and oil is provided for and when an airplane is lost it is the owner's personal loss, provided he manages to reach safety! Ten fliers were killed during 1942 and the C.A.P. recently paid tribute to them as well as the hundreds of other pilots who have voluntarily assumed the job of coastal patrol work, thereby releasing hundreds of Naval patrol planes and Army bombers to war theaters. Their stories are legend, not all of which are of a military nature. When an important power line broke near St. Cloud, Minn., during a storm, the break could not be located by the firm's cruiser cars due to highway congestion. A C.A.P. flier found the break in less than an hour by flying low along the line. Another C.A.P. flier found an Army bomber that had been the object of an intensive search for more than six weeks in South Carolina. Another C.A.P. flier has become known as "Santa Claus" to youngsters in the region of Denver due to his scheduled aerial deliveries of chewing gum, candy bars and lollypops to children in outlying farm districts.

According to Roy E. Marquardt, well-known to MODEL AIRPLANE NEWS readers for his many aerodynamic and model design articles (in reference to super-speed in the region of the speed of sound): "The available data seems too sparse to bother you with; however, it does seem to indicate that a little more 'umph' in the airplanes that are now diving at 700 mph. may very soon carry them over the peak and double the velocity." That means 1400 mph.! But between that 700 mph. and 1400 mph. lies a vast, unknown region which has completely baffled aerodynamicists the world over. The "Mach" number is the ratio of speed of a given airplane to the speed of sound and in the region of a Mach number of about .75 the drag coefficient suddenly darts upward and heads straight for infinity as it passes .80 and .90 and approaches 1.0, or around 700 mph., depending upon temperature. What is going to happen next no one can yet tell, but aerodynamicists are working day and night on the problem and one day will find the answer. It has been generally conceded, however, that the speed of sound is about the maximum for the present internal combustion engine-propeller combination. Some form of propulsion will be required to break through that mysterious gap in the aerodynamic science."

Major Grant Mahoney has been itching to add one more plane to his score of four and become an official ace in the South Pacific but he can't seem to make the proper connection. Recently, Major Mahoney caught a Jap locomotive south of Lashio, Burma and blasted its boiler to bits to ring up his fifth. The Army congratulated Major Mahoney on his becoming a Locomotive Ace, but he is still looking for another Zero!

One of the most concrete evidences of American aircraft manufacturers' desire to cooperate among themselves and the government in production of aircraft for the fighting fronts is the formation of the Aircraft War Production Council, Inc., on the East Coast and a separate council on the West Coast. In April, after a year's successful independent operation, the two councils joined hands in Los Angeles and formed one national group whose sole purpose is exchange of engineering and production information among member

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companies and all interested smaller companies. The value of the group cannot be overestimated as it slashes by halves and thirds cost and time of independent research and development of parallel projects by different companies. Member companies include: Aviation Corp., Bell, Brewster, Curtiss-Wright, General Motors Aviation Division, Fairchild, Martin, Republic, Consolidated-Vultee, Douglas, Lockheed, North American, Northrop, Ryan and Vega aircraft companies. President of the National Aircraft War Production Council is Glenn L. Martin of the firm bearing his name; vice-president is LaMotte T. Cohu, chairman of the board of Northrop, and directors are J. Carlton Ward, Jr., pres. of Fairchild; Larry Bell, pres. of Bell; Robert Gross, president of Lockheed, and T. Claude Ryan, president of Ryan Aeronautical Company.

VICTORY

Axis Assassin

(Continued from page 27)

engine nacelle and are of hydraulically-operated design, a departure from the predominantly electrical controls favored by German designers because of their low vulnerability. The actuating cylinder is mounted on the fuselage floor and pushes two tubes which lower or raise the flaps by the movement of an eccentric.

The dive-brakes on the Me-210 are unique in that their action is entirely in a spanwise plane. They are the "venetian-blind" type consisting of extruded L angles spaced horizontally on two lever arms. The upper brake rotates clockwise into the wing, the lower, counter-clockwise. The section of wing immediately aft of the dive-brakes consists of a duct area which is opened to the slipstream of the bottom surface as the dive-brakes open. This duct is designed for boundary-layer control by drawing the lower surface air inside the wing and exhausting it at the trailing edge thereby effectively controlling turbulence and its dangerous effects on the tail surfaces. A second duct entrance, immediately aft of the boundary-layer duct takes in air for the oil coolers.

Fuselage is almost identical to the Me-110; fabricated of strips of aluminum about 17" wide, each alternate strip being rolled along the edges into a Z section. Other alternate strips are riveted to the backs of these sections and the fuselage is thus provided with integral frames, there being no other lateral stiffening members.

The fuselage is split along the vertical plane of symmetry and the halves are carried along the assembly line separately while various installations are made after which they are riveted into a completed unit.

Tail surfaces are conventional spar-ribs-sheet covering structure, horizontal stabilizers of symmetrical airfoil are interchangeable with each other. The rudder and elevators are fabric covered, equipped with very long, narrow trim tabs controllable from the cockpit.

The crew is located in the extreme nose of the ship, the pilot having a remarkable field of view with large plastic panels provided down to the floor in front. The radio-operator-gunner is seated in a swivel-chair immediately aft of the pilot, separated from him by a shelf on which are mounted the radio units. The cockpit is fully enclosed in a streamlined, transparent plastic enclosure.

The landing gear is the conventional retractable tractor type similar to that of the Me-110 but varying widely from it in the method of retraction. The Me-210 main wheels rotate 90° upon retraction and fold into the wheel well flush with the lower surface similar to our Curtiss P-40 series. Retraction is by hydraulics and clam-shell doors completely seal the openings following retraction.

The plane is powered by two Daimler-Benz DB-601-F1, developing 1400 hp each and are mounted in streamlined nacelles at the outboard end of each inner wing panel. This engine, used almost exclusively in German fighter and bomber craft, has a volumetric capacity of 2,069 cu. in. and weighs about 1460 lb. Chief points of interest in this engine are its direct fuel-

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injection feature and a controlled hydraulically-coupled (fluid drive, as on recent American automobiles) drive for the supercharger.

Chief advantage of the fuel-injection is in lowered fuel consumption due to greater turbulance of the entering fuel affording more thorough air mixing. The fluid-drive supercharger coupling protects the blower from sudden loads imposing strain on its gearing or mounting units and affords an infinite number of ratios, as distinguished from the fixed ratios of the gear-driven type.

The DB-601-F1 as installed in the Me-210 has special air ducts mounted in the leading edge of the engine cowling which are used for cooling the exhaust stacks and spark plugs. By directing air into the exhaust stacks a degree of flame-dampening is achieved making the Me-210 more effective as a night-fighter type, although complete flame dampening for night-fighters, has not, as yet, been achieved.

The engines are mounted cantilever as before with the exception the bearing members are welded box sections replacing the ubiquitous elektron (magnesium) alloy forgings formerly widely used. A simple tubular member has been used as the tension member ties to the top fittings on the firewall.

The fuel system consists of six self-sealing tanks mounted in individual compartments in each inner wing panel forward and aft of the spar. They are of composite construction being made up of inner and outer layers of vulcanized rubber separated by a layer of raw latex rubber which expands when mixed with fuel. The tanks are completely flexible, are about 3/8" thick, mounted on the top wing skin. They have a normal capacity of 550 gallons and an overload capacity of 690 gallons, giving the Me-210 an endurance at cruising rpm of nearly 10 hours, giving rise to the use of the ship for long-range bomber escort duties.

The oil tanks are of similar construction and are mounted in each inner wing panel aft of each engine nacelle. The oil coolers are mounted in the outer wing panels just aft of the spar and outboard of the wheel well and air entrance and exit are controlled by panels in the lower wing skin. Fuel and oil lines are protected by C-shaped armor plating bolted together to encase the lines along straight portions of their travel.

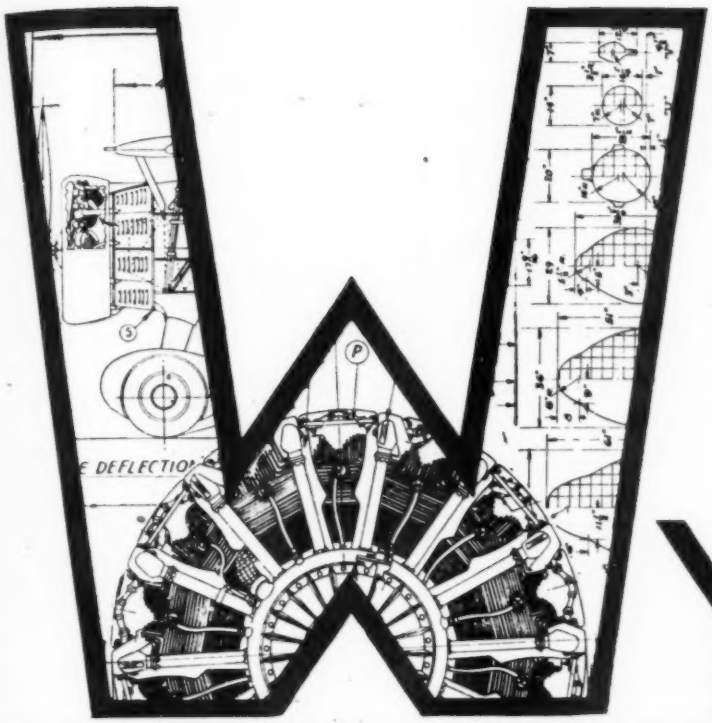
Messerschmitt Me-210 armament is both heavy and ingeniously mounted. The forward firing guns are mounted beneath the pilot's floor in the ship's nose and consists of two 20 mm. shell-guns mounted side-by-side and two 7.9 (30 calibre) machine guns mounted inboard of the cannons. As in the Me-110, the radio-operator handles the replacement of ammunition drums (60 rounds per drum) in the 20 mm. cannon, the pilot handling the aiming and firing. The guns are encased in blast tubes over the barrels which terminate in elliptically-shaped openings in the nose leading edge.

The rear guns are two 13 mm. (50 calibre) machine guns mounted in remotely controlled barbette turrets in the after fuselage. This feature is one of the most unique to come out of Germany in the way of aircraft armament and represents the first power-operated flexible gun turrets to be fitted to a service-type German airplane. Briefly, the barbette consists of a large cylinder mounted horizontally across the fuselage and fitted with a machine gun in each end. To raise or lower the guns, this cylinder is rotated; to swing the guns horizontally, the gun is moved. The rear-gunner is fitted with a similar cylinder which carries a reflector-type gunsight at each end. To elevate the guns, the gunner through a pistol grip, rotates his cylinder which moves a cable-and-pulley arrangement to the servo unit. This servo unit comprises two rotating drums which are driven by a 1.5 horsepower electric motor operated by airplane generators. Rotation of his drum causes a simple brake-band to tighten on the rotating servo drum and therefore cause a cable drive to the barbette to move. This engages with a rack and pinion and rotates the barbette drum in elevation. Movement of the guns in azimuth is similarly controlled with the exception that the azimuth gear rack is mounted internally within the barbette and its movement is interrupted within a gear box to the guns in the straight rear position. In firing at an enemy from right to left, the right gun moves intowards the fuselage and stops at which point the left gun moves from the fuselage and follows the enemy out. The guns have a movement of 35° from horizontal in elevation and 35° outboard of the straight-rear position in azimuth (horizontal plane).

In addition to this formidable gun armament, the Me-210 carries two 1100 lb. bombs in the nose beneath the pilot's floor. These are released through conventional bomb doors which are operated by the pilot. No provisions have been made for the use of a bomb-sight and the bombs are supposedly released at the discretion of the pilot, probably in a slight dive to facilitate his aiming at the target. The portion of the nose forward of the pilot is glass-enclosed to provide plenty of view forward and, insofar as possible, down in order to make the bombs effective.

The 13 mm. machine guns used in the turret are of particular interest insofar as the Axis has not heretofore had a .50 caliber machinegun (nor does England) in active service. Italy had developed a Breda-Safat gun for anti-aircraft purposes from the British Vickers type which was, in turn, copied from the American Colt-Browning patents. An examination of the German gun, however, reveals a close similarity to the American design, main difference being in the use of a resilient material in the shape of discs in the buffer housing rather than the oil used in the American design.

The Messerschmitt Me-210 has a total of 900 lb. of armor plate located throughout its structure, easily the most weighty yet installed in a German plane. This may be regarded as a new move by the Luftwaffe to protect its crew-members more thoroughly than formerly when pilots and crews were considered expendable material of war. Chief plates of armor are located as follows: large discs mounted behind the propeller spinners to protect the engines, large plates mounted on either side of the nose forward of the pilot and a large plate mounted horizontally forward of the bomb and cannon compartment ammunition, the



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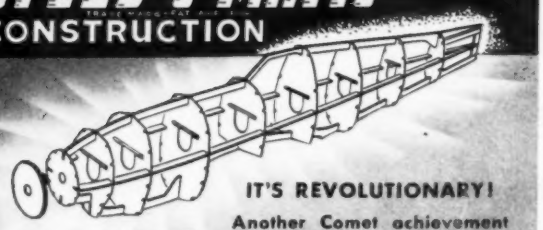

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bottoms and backs of the crew's seats, a large plate aft of the gunner and large plates covering each wheel in the retracted position. This last-mentioned is of interest insofar as it would indicate the Luftwaffe has had considerable difficulty with tires being shot up in the air and subsequent ill-fated landings upon return to the home field.

The Messerschmitt Me-210-A1 has a wingspan of 53 ft. 9 in. and a fuselage length of 40 ft., 3 in. Wing area is 355 sq. ft. and it has an aspect ratio of 8.13. The ship weighs 21,350 lb. fully loaded which gives it the phenomenally high wing loading of 60 lb./sq. ft. and a power loading of 7.6, also exceedingly high. This high wing loading indicates a particularly long takeoff and landing-run, high horizontal level speed and comparatively poor maneuverability. This high power loading also indicates a poor rate-of-climb and high fuel consumption necessitated by the use of high horsepower during cruising operations as evidenced by use of fuel injection and an abnormally high fuel capacity.

This Me-210-A1 has a top speed of 370-380 mph at 18,000 ft., according to a British Air Ministry estimate. It indicates the change of Luftwaffe tactical requirements from the short-range high-performance fighter to the heavily armed and heavily armored bomber-fighter which evidences a growing defensive strategy.

VICTORY

BUY WAR BONDS FOR VICTORY

Plane Tricks

(Continued from page 31)

J-3. The effective shock absorber shown is made by attaching small blocks or pieces of cork at the front and rear of the pant. Solder up the wire frame, pivot it at the back and secure the front with rubber bands.

K

A wire landing strut is easily formed as shown, and wrapped with layers of paper until proper strength is obtained. Generous bands at top and bottom give better support.

Several layers of paper wrapping may be necessary.

L

Carve a spinner, or turn one on a lathe. Finish, wax and cover with narrow paper strips. Cut out slots to fit propeller blades snugly. Extend spinner far enough behind the propeller's rear face to set in a circular plate as shown.

M

If the landing gear struts are attached to the fuselage, glue the bent ends inside of the shell and reinforce with a covering of paper strips.

Illustration shows completed landing gear leg ready to be attached as shown at left.

Apply an extra strengthening strip along the trailing edge of the wing to reinforce the joint made by the upper and lower surface.

Air Ways

(Continued from page 24)

neutralizing stabilizer, and an adjustable control handle.

"The motor, an Ohlsson '60' Custom, has throttle control set so that it can be idled up or down in the air. I fly it and cut the ignition off and on and the plane jumps without motor failure. I can bring the ship in under perfect control by throttling the motor down and cutting the ignition when the plane settles. This is done with the use of three lines for flying and throttle in all."

Joe E. Ortner, wearing The Argentine's Centro de Aviacion shirt, picture 5, proudly displays his winning Interstate Cadet. Writes Joe from faraway Buenos Aires:

"Model activity in this part of the world is ever increasing, and contests take place regularly, at least once a month, attended by from 200 to 300 contestants. Rubber shortage has turned many to gliders.

"I entered my flying scale model Interstate Cadet (built from M.A.N. plans) in one of the latest contests and placed 1st out of 35 with an average time of 1 min. 35 sec. in three launchings. The model gliders like a contest ship. The only thing missing for actual contest work is fast climb; otherwise it is a grand little plane."

The artistic silhouette, No. 6, is of Charles Folk, 32 Chapel St., Hampton, Va. and his 6 ft. job powered with a Bantam. The ship, according to Folk, flies remarkably well in an almost vertical spiraling climb, and comes along the dock in a superglide. The glide is due mostly to the wing loading, slightly under 8 oz., the ship weighing only about 18 oz. The fuselage is entirely planked with the cabin swooping in at the back of the wing—pylon fashion. Twin rudders with *very* little area work swell.

Then Charlie goes on to hint and threaten:

"Would send a few pictures of my new '60' job but am afraid you might blow a blood vessel or sumpin. Will give a hint about it though. It's of welded steel construction and weighs only a little better than 2 lb. Wing is 6 ft., chord 12 in.; plenty snappy and a good flier. Don't tell anybody but three of us sneaked out to the field the other day and flew it with a wing of 430 sq. in. powered with an Ohlsson '60.' Six thousand feet a minute possible? Well, maybe, wing finally sheared through, though. Just don't get me mad, brother! I might get even and send a shot of it in to you!"

In picture 7, Mr. N. E. Broadway of 318 Linwood St., Rochester, Mich., is shown making a motor adjustment on his beautiful Mercury. This framework shows exceptional care in construction.

Dwight Hartman of Argenta, Ill., built the Messerschmitt depicted in picture 8, from Earl Stahl's flying scale plans that appeared in our November 1940 issue. Dwight goes on to say:

"My friend, John Luckenbill, has built both the Fleet Trainer and Miles Magister from your plans while I constructed the Skyfarer as well as the plane pictured. The Fleet Trainer flew the best of all while the Messerschmitt and Magister made very fast flights. The Trainer, equipped with air wheels, has flown over 2 min. in cool eve-

ning air. I have built eight gas models and still own six motors.

"I would like very much to correspond with any gas modelers living in Illinois."

Modesty does not permit us to tell you what Hartman thinks of MODEL AIRPLANE NEWS.

Unfortunately the Brewster 340 dive bomber picture in photo 9 blends too well with the background to do it justice. The fine craftsman is Edward Lutter, 5546 Upland St., Philadelphia, Pa. The model has many details, including a sliding hatch, revolving machine gun turret, retractable landing gear and tail wheel, all movable controls, bomb-bay doors that open for a bomb that comes out on an ejector arm, instrument panel, navigation lights that light up, and finally landing lights that throw a beam for 30 ft. Wingspan of this realistic model is 30 in.

From the AAF College Training Detachment at La Grande comes picture 10, showing Gordon E. Codding and his model B-17E taken before he wore the proud badge of Uncle Sam's sky warriors. His letter gives details of the scale Flying Fortress:

"This model was built to fly and one day will have four gas motors. Wingspan is 8-1/2 ft.; weight, 5 lb. as shown, 9 lb. complete. After extensive research I found that it would be impossible to synchronize all four motors so I decided to use the control surfaces to counteract the forces produced by uneven pull.

"I have vertical flaps, facing forward, in front of the outboard nacelles. These are very sensitive to air pressure coming from the slipstream and are connected to the rudder flap in a way to counteract the uneven pull of the props and prevent turning.

"The wings were built with a system of side-wire-facing air flaps connected to the ailerons in such a manner as to keep the wings horizontal—an automatic pilot, so to speak. This system has been tested on gas models before and my own tests, made with a rubber powered B-17E, which included both systems, proved my calculations correct.

"The model pictured has wing and cabin lights, shock absorbing landing gear, all movable surfaces with full moving gun turrets. When the Air Corps gives me time I am going to make some test flights—the results of which I will send along.

"I take great delight in building gas jobs that others think impracticable or impossible but I feel that someone will tackle the job sooner or later—so why shouldn't it be me? In closing I will truthfully say that my model building has been invaluable to me here during my Air Corps training."

From San Jose, Cal., Calvin Okagaki of 546 No. 3 Street sends a flight picture, No. 11, of his three original-design solid scale models which range in size from 7-1/2" to 9-1/2". We quote from Calvin's interesting letter:

"All are pursuit designs and were first conceived some years ago. Except for a camouflaged model, the planes are so designed that the large motors would be buried in the fuselage to drive twin propellers.

"While the mechanical difficulties involved in such a design are not easily overcome, the advantages might well be worth the trouble. By burying the motors in the fuselage a more concentrated mass would result as in the Dutch Koolhoven fighter or the P-39, and this would result in a more maneuverable plane. Although a large diameter propeller might be more efficient aerodynamically than one of small diameter, several physical limitations would be involved.

"To absorb the power of a large motor or system of motors twin propellers could be of smaller diameter than a single one; thus there would not only be less chance of breakage and torque trouble, but shorter sturdier landing gears may be used. Bringing the two propellers close together would aid directional stability. This is especially possible with the Grumman-like model in which the pilot would have excellent vision because the propeller extensions are so small. This arrangement would make a highly efficient wing, particularly in the pusher model.

"The exhaust pipes in these models were simulated by filing notches in short lengths of aluminum tubing. Airscoops are bent from thin aluminum sheets. The windshield is also a bit of thin aluminum sheet. A dull zinc oxide paint primer was used to give the camouflaged effect—a rusty orange-brown color.

"A short time ago readers of the Air Ways column were asked to give their ideas on future air transports. Well, I'm a reader and I'll hazard a guess.

"Commercial air transports will come in several sizes. These will include small five passenger special-charter planes of short range, larger eighty passenger planes for inter-city use, and giant three hundred passenger planes for trans-national and international service. Corresponding freight transports will also be used.

"These airplanes will be 'flying wings.' The largest of these will weigh 150 tons loaded of which 50 tons will be useful cargo. This tremendous load capacity in such a light airplane will be made possible by several factors. Better alloys and finer structural design will produce a lighter yet stronger frame capable of carrying this greater payload. Smoother surfaces will reduce parasitic drag. More efficient airfoils and possibly a 'ventilation' system for the

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1 1/4" Lewis....6c
1 3/4" Lewis....8c
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3/4"....each 3c
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17

ft.

"These airplanes will fly on radio beams, and also land by radio controlled motors. Aircraft detectors for low visibility which would employ infra-red ray detectors or frequency modulated transmitter-receivers would be regular equipment.

"That's a lot of imagination—but it's my guess."

Picture 12 portrays L. L. Salisbury of 3231 Lafayette Ave., Omaha, Nebr., exhibiting his twin motor U-control model which he designed and built primarily for pleasure flying and appearance.

"I wanted a plane easy to fly," he says, "yet sleek in appearance; rugged in structure yet fast enough to give a thrilling performance. I achieved a fair measure of success in all departments. The speed is 55 mph with landing speed sufficiently low to assure safety.

"It has a wingspan of 46 in., area of 270 sq. in. which results in a wing loading of 22 oz., as it weighs just over 40 oz. Two Ohlsson '23s' supply the power for the 10 in.-8 in. pitch props. (Not in the picture.)

"I built the body by the crutch and former method with equal sized formers on top; on bottom a completely circular crossection. The model is completely covered with 1/16" sheet balsa except for the nose which was shaped from the point 2 in. back. The wing was built in the regular manner and covered with sheet wood on the leading and trailing edges; the center section out past each nacelle. The nacelles were built in the same way as the body with the crutch cemented to the bottom of the wing then faired over the top. The motors are mounted radially on plywood firewalls. Two separate units were used for ignition and a third line is fastened to a double pole knife switch which enables me to cut the motors at any time.

"During tests I found that both motors had to be turning at nearly equal speeds to be efficient but there was no tendency to turn inward when the inside motor quit first; in fact it flew quite well on one motor.

"I have a copy of your *Model Airplane Design and Theory of Flight* and find it invaluable. I have just completed a free flight model based on its theory, which I expect to test soon.

"In spite of many difficulties we die-hards of Omaha expect to continue to fly indefinitely."

Fourteen-year-old Rollin Leare of Lake Road, Bay Village, Ohio, sends us picture 13—showing his ferocious-looking P-40, which was taken with the model suspended in front of an oil painting. This ingenious modeler spent most of the winter building

a Class B gas model—and used up the last of his balsa in the process.

"Enclosed is a picture of my most recent gas job, the Gremlin," writes David Rosenberg from 4950 Hingston Ave., N.D.G., Montreal, Quebec, Canada. "It is my third gas job though I have been building rubber models for the past six years."

"The Gremlin has a wingspan of 56"; wing chord, 9"; area, 470 sq. in.; stabilizer area, 32% of the wing; total weight, 26.4 oz., and an 8 oz. per sq. ft. loading. The plane is powered by an Ohlsson '23.'

"In spite of low weight the ship is remarkably strong due to built-up construction of the fuselage members, cross braces, longerons, etc. The lower half of the body is covered with 1/16" sheet balsa. The landing gear retraction is controlled by the ignition air timer. The wheel retracts about five seconds before the motor cuts.

"To prevent loss due to the strong Montreal thermals the ship is equipped with a 'thermal buster.' A new type timer can be seen near the rudder of the ship. The timer releases a pin which in turn releases drag-flaps built into the rudder.

"The Gremlin has not been power flown yet but it has a remarkable glide, smooth floating and steady during hand-glides; I consider the Davis No. 4 airfoil, with which the plane is equipped, to be a contributing factor.

"The photograph, No. 14, was taken at F9 with a one-second exposure on Ortho X film lighted by three photoflood lights."

Edward J. Orndorff, 124 S. Manhattan Place, Los Angeles, Calif., is shown in picture 15 with his modernized version of the old twin pusher. The airfoil was taken from the root air airfoil of the "Fighter of the Future"; the aero-dynamic setup was taken from the setup for pushers published in Model Airplane News recently. The main wing was glued to the frame to give strength with light construction. Orndorff says the model has a fairly good glide and then goes on to propound a question:

"With a good part of large aircraft development devoted to multi-motored aircraft, how about more twin motor rubber jobs? It takes two people to wind a single motor contest job anyway! A classification could be established for multi-motored planes."

Two members of the Norristown Flying Wings Model Airplane Club are responsible for picture 16. They are Buel and Russell Carter of 1845 W. Main St., Norristown, Pa., who write:

"Enclosed please find photo of what we call a remarkable plane! Yes, sir, 'seein's believin' '—that's a Forster 1/3 hp. engine in that model! It climbed into the sky like a corkscrew and floated around like a feather for flights averaging 1-1/2 to 2 min. Incidentally, we correspond with Carl Goldberg regarding this drastic increase in power before construction was actually started and he said that it was possible and wished us luck.

"This plane was completed on August 21st, 1940 and has since been flown with Forster, Baby Cyclone and P-30 engines. When powered by the Cyclone it was entered in the Pottstown Gas Meet of Sept. 14th, 1941, to take 4th place in Class C with a flight of 7 min. 37-3/5 sec. Strangely, it went out of sight, stalling violently, but was found five days later about nine miles away from the starting point.

"That's not all—it was flown successfully as a G-line control model! Fantastic? The entire fuselage is covered with 1/16" sheet balsa and has stood up wonderfully under the strain, considering all the hard knocks the ship has taken. It is still shipshape and rarin' to go—a veteran of 57 flights."

Picture 17 comes to us from L. de la Espriella, Cartagena, Columbia, South America, P.O. Box 160. The photo shows a group of Columbian modelers and a sample of their handiwork.

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Club News

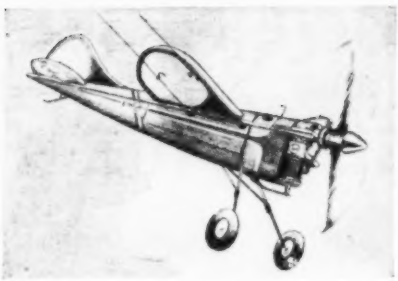
New York

In a recent letter Fred J. Cusik, corresponding Secretary of the Prop Spinners Club of Woodside, announces August 4th as the date for the club's 4th Annual Gas Model Contest. At this writing the field where the contest is to be held is not chosen. Those interested should write Mr. Cusik at 31-34 55th Street, Woodside, N.Y.

Illinois

Mr. C. J. Hein, director of publicity of the Sky Wolves of Des Plaines, sends us a summary of the Sky Wolves 1943 Introduction U-Control Model Airplane Meet held on April 18th.

The first U-Control model airplane contest of the 1943 season to be sponsored by the Sky Wolves was held Sunday, April 18th in Des Plaines, attracting 30 entries. Control line planes of every description, ranging from sleek little 18" speedsters to a 48" Stinson Reliant, took part in the competition. Prizes were awarded for A-B-C Speed, Precision Landings, Balloon Objective and Aerobatics.



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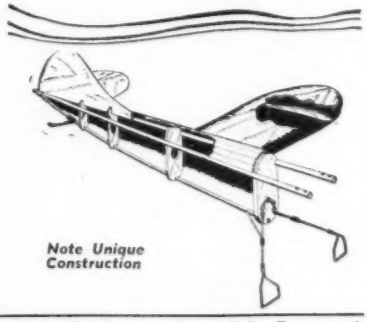

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Bob Friske of Harvey, Illinois, took top honors for the day by scoring four firsts and one second. Ken. Flaglor of Des Plaines placed second with two firsts and one third.

Speed Trials

Class A—Bob Friske 39 mph. (only plane to qualify).

Class B—Bob Friske, 52 mph; C. J. Hein, 44 mph; Ken Flaglor and Jim Bender tied for third with 43 mph.

Class C—Bob Friske, 57 mph; Milton Burley, 54 mph; C. J. Hein, 43 mph.

Precision Landings

Ken Flaglor, first place; Bob Friske, second place; Jim Bender and C. J. Hein, tied for third.

Balloon Objective

Bob Friske was the only contestant to score in this event.

Aerobatics

Ken Flaglor finished in first place by executing perfect control while hedgehopping his high speed ship within inches of the ground.

The next U-Control meet sponsored by the Sky Wolves was held on May 30th and known as the "Sky Wolves Championship Meet."

Additional contest dates are June 13th, July 4th, August 8th and September 5th.

California

The following report of Ocie Randall recently appeared in the "FGMA News" (Fresno Gas Model Association).

"Our April 25th monthly contest was exciting to say the least. We were on a new field and thermals were positively vicious. Any ship that would get above 50 ft. was a goner for a long ride if it wasn't equipped with a dethermalizer. At one time the starting circle was devoid of contestants as everyone was out after their planes. At times after the motor cut the ship would continue its climb on the thermal as though the motor was still on at half speed.

"All of the contestants that showed up at the field thought sure they were in for a good day as they could see that the 'Gremlins' were grounded. There were untold millions of tiny insects that knew how to bite; they must have been mad at being grounded by our Contest Director and so took it out on the hapless contestants and spectators. Some of us are still nursing bites. Our last reports from the field tell us they are gone . . . They have outgrown the embryo stage and are on their way to bigger and better things.

"I had a long talk with Marshall Mahr, an old club member, who is now in the Air Force at McCelland Field, Sacramento. He says hello to everyone. We wish you luck, Marshall, and will look for you back with us in the future with some more of your new model designs.

"There were only about three washouts at this contest. The worst I believe was our contest director, Bill Dunham's, Little A job with an Elf Twin Motor. Then there was our new club member, Jimmy Ducovic, who flew into a car and busted things up pretty badly.

"Most of the planes that were lost have been found; there were about 14 unaccounted for at one time. Tex Marbut, while out searching for his big Herky plane, found Dutch Van Tassel's Sailplane. I should say he found the motor as the cattle made a shambles of the plane. They do love the taste of dope and balsa!

"Our club is growing now and that is most encouraging; there have been 6 new members signed up of late and more intend to join. Hats off to our new set of officials who are working feverishly to make the club a real club. They are after a permanent field that is sorely needed. Our meetings are very interesting affairs and things really hum.

"The club is asking for a sanctioned A.M.A. Contest for the middle of August so watch for it and get your A.M.A. license.

"Boy was I lucky! I have a brand new Super Cyclone G. R. I had quite a time getting it as it was not assembled yet and there was no con rod for it. However, it was finally found and now the motor is running fine.

"We were honored by the presence of Pryor Passarino of Healdsburgh, California, and his Westerner with a Brown motor. He voiced his opinion of the Fresno bunch thus, 'A swell bunch, well organized, wonderful flying field, and a pleasure to fly here, and I'll be back with more and better planes, you bet!'"

Results of April 25th Contest

Class A	*Design*	*Motor*	*Time Sec.*
Don Martin	Playboy	Ohl. 19	122
Bill Dunham	Own	Elf Twin	70
John Marshall	Own	Bantam	.03

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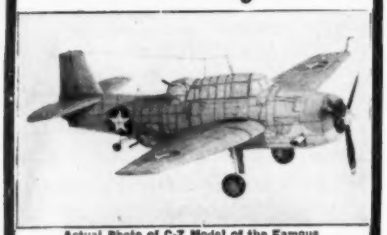

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Arle Armstrong	Own	Ohl. 23	680
Bill Dunham	Own	Torpedo	555
Ocie Randall	Zipper	Phantom	525
Tom Jenkins	Zipper	Forster	450
Class C			
Tex Marbut	Herkey	Cyclone	1612
Paul Nieto	Herkey	Ohl. 60	1450
Arle Armstrong	Herkey	Ohl. 60	842
Dick Nelson	Zipper	Bunch	652
Red James	Playboy Sr.	Ohl. 60	600
Jr. Results			
Bud Warner	Playboy	Phantom	280½
Don Martin	Playboy	Ohl. 19	122
Jim Ducovic	Zombie	Ohl. 19	66

Correspondents

A plea from W. James, 481 Uxbridge Road, Southall, Middlesex, England, should not go unanswered by us model builders:

"For sometime I have been a very enthusiastic aeromodeler and I am also very much interested in America. It is difficult to get your magazine on account of the war but when I do manage to get one it is the limit of the information I get about aeromodeling in America, so I wondered if I couldn't get more steady information by corresponding with some pen pals, male or female, about my own age, 15."

VICTORY

Modeling Your Future in Aviation

(Continued from page 23)

semble A, Fig. 110, the plane acting in the same manner as if the normal stabilizer were used in its normal position. Theoretically, there should be little difference in flights.

So it may be assumed that the closer to the wing the stabilizer is placed, the less stability the plane will have. In fact, stability is proportional to the distance from wing center to stabilizer center. However, it is proportional to stabilizer size, so we reach an important conclusion, namely—that *the product of the stabilizer size times its distance from the wing is constant for any degree of stability on any given plane.*

For these tests the point on the stick indicating the center of the large stabilizer has been selected so its distance from the wing center times the area of the large stabilizer will be equal to the distance of the normal stabilizer times its area. Consequently, longitudinal stability should be the same in both cases. From this, one will conclude that the moment arm will have the same effect upon both fin and stabilizer. This can easily be proved by attaching the normal size stabilizer in normal position A at the end of the motor stick, and placing the various fins in position B, Fig. 115, for testing.

Start with the normal size fin, attaching it to the side of the stick with its center at point S. Balance the plane carefully by weighting the tail if necessary. The wing should be kept in the normal position with its center over the mark on the stick, indicating the plane's c.g. When the plane is in balance wind the motor and launch it in normal manner. By this time it will probably not be necessary to caution the experimenter to launch the model gently, and not throw it. Nevertheless, it is well to guard against this for there is always a tendency to give the model too much initial speed. A flight with the normal fin in position B should indicate directional instability with a spin resulting as a reaction from a steep climb. If the climb is gentle the plane may not spin but the tail will probably sway from one side to the other, causing an oscillating rolling flight. If the plane is not extremely unstable with the fin in this position, it can be moved closer to the wing and flown again. Eventually the point will be reached where directional stability will be nearly zero and the flight of your ship will be extremely erratic.

Next try the small size fin in position B. The area being reduced and the moment arm being very short, there should be very little directional stability. Tests undoubtedly will indicate this.

Now try the over-size fin. Here again, as in the case of the stabilizer, this area times the moment arm will be equal to the normal size fin times the normal moment arm. Consequently, stability with a large fin and a short moment arm should be the same as in the case of the normal test plane.

The only effect of increasing the size of the tail surfaces and placing them closer to the wing will be a reduction in flight efficiency due to the added weight of the surfaces. If a plane is built with this shorter moment arm, large stabilizer and large fin, it probably will not be heavier than the normal test plane because motor and motor stick will be shorter and lighter. This will compensate for the added weight of the tail surfaces. However, the motor being shorter, fewer turns can be stored. This of course will reduce the length of flight.

Following the reasoning suggested by these tests, it can be assumed that the tail surfaces may be smaller when a longer moment arm is used. So let us carry out a series of tests using the stick extension boom shown in Fig. 113 and 114. Fasten it to the rear of the motor stick as previously specified. For the first test, place a normal fin in position A, Fig. 116, and the small stabilizer in position B at the end of the boom, holding it to the boom with a rubber band in the usual manner. Do not move the wing from this standard position. To balance the plane add weight to the nose in the customary manner. When it balances at the center point of the wing you are ready for your test flight. There will be little difference in stability from the basic test model with normal fin and stabilizer, because the boom has been doubled in length and the stabilizer area halved, the product of the distance times the area in both cases being the same. The flight path should resemble A, Fig. 110.

Next replace the small stabilizer with the normal size one. A flight will indicate a great increase in longitudinal stability. The plane will be very steady, having little tendency to deviate from normal flight course, but if it is disturbed slightly the recovery will be slower than in the case of shorter moment arms. In other words, it will tend to hold an unnatural course, as well as a normal one, when once it is displaced. When the over-size stabilizer is used at the end of the boom many curious types of flight will result. Your ship should be super-stable and probably could be flown by a three-year-old child with good results.

The same procedure can be followed in respect to the fins—testing first the small fin, then the normal size, and finally the

over-size fin. With the small fin at the end of the boom directional stability will be approximately the same as the basic test model. The normal size fin will decrease any tail swing and will provide great steadiness as long as the model flies straight. However when turning, the fin, being oversize and holding the tail on a steady course, the nose will slide inward, causing a dive into the ground, as indicated in Fig. 112.

This illustrates the fact that there must be a relationship between fin area and wing dihedral, as indicated in the preceding article, July issue. If the fin is too large, on a turn it will remain in place while the nose will slide inward; if it is too small, the reverse will take place, resulting in a spin as shown in Fig. 111. So when the tail moment arm is increased, the fin area must be decreased proportionally if stability is to be retained. This is not the case with the stabilizer which may be made as large as desired, provided stability is the only issue. Larger stabilizers, however, will reduce flight efficiency *if stability is already complete.*

In some cases stabilizers are made larger with the intent of increasing efficiency because stability is increased to such an extent that the flight course is very steady—stalls, dives and erratic behavior being entirely eliminated. This of course increases the over-all flight efficiency because recovery from any deviation from normal flight course absorbs power. For example, if the stabilizer is small and the plane has a tendency to stall, it will lose altitude at the end of every such maneuver and will require additional power to regain it. So over the whole course of the flight there will be a considerable loss of power and altitude, resulting in less flight duration. Longitudinal stability, therefore, has great bearing upon flight efficiency and duration. If a very steady flight can be attained by increasing stabilizer area or length of moment arm without increasing the weight materially, such an increase is warranted.

Still another tail factor has an effect upon flying, namely: the angle of the stabilizer relative to the thrust line, and in the case of your model the latter is the under or upper side of the motor stick. The stabilizer of the normal test model was placed flat against the stick in a neutral position; that is, at zero angle of incidence. The effect of any difference in this angle can be readily determined by testing.

First, equip your plane with normal size fin and small size stabilizer, placing a small 1/8" block between the front edge of the stabilizer and the stick, Fig. 117. This will give your stabilizer a negative angle of approximately 3° (— 3°F). After the model has been balanced a test flight will indicate that this small stabilizer will provide approximately as much stability as the normal size one. However, the balance of the plane with this decrease in stabilizer angle will be changed considerably.

In such cases, the c.g. instead of being at the center of the wing for normal flight, will have to be at a point 25 to 30% of the wing chord back of its leading edge. In other words, with this extremely negative stabilizer, pressure on the tail will be considerable when in flight, tending to nose the model upward. Consequently the center of weight will have to be further forward to compensate for the nosing up tendency. If this is indicated after your first test flight, you may weight the nose to move the c.g. forward to the required point, or slide the wing slightly backward, so the point of balance is 25 to 30% of the chord length from its leading edge.

Under these conditions, the flight with the small stabilizer will be similar to that indicated by A, Fig. 118. The climb will be quite sharp; it will then level off and the glide finally will be steep. Succeeding tests with normal size and oversize stabilizers placed at this same angle, will give flights indicated, by B and C respectively, Fig. 118. The conclusions drawn are that a decrease in stabilizer angle will produce a steeper climb, but also a steeper glide. In other words, there will be greater difference in balance between power flight and gliding flight. When increasing the area, this increase in angle smooths out the flight considerably reducing the degree of climb and steepness of glide, but in any case the climb and glide are comparatively steep and a large negative stabilizer angle is not advisable.

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In the Scientific Model Airplane Company's July advertisement the "Defense Series" kits were priced at 50c each. This was a typographical error; the correct amount is 95c per kit. See page 39 this issue.

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tests they can immediately conclude that the stabilizer setting is incorrect. The glide can be made flatter and flight lengthened by setting the stabilizer more positive, and if necessary increasing its area to retain the same stability.

With conclusion of these tests, you will have undoubtedly passed several hours of interesting flying. Possibly there may be some confusion in your mind concerning the various relationships between area and moment arm lengths. However, further tests carried out systematically should clarify your ideas.

Next month we will discuss the peculiarities and reactions of the dihedral angle.

VICTORY

Amazing Aerofacts

(Continued from page 36)

scout biplane from the upper wing of a Curtiss Flying Boat over England in 1916! The scout plane intercepted a German Zeppelin after the mid-air release!

6. German Messerschmitt fighters attacking England are fitted with Handley-Page wing slots invented by an Englishman, Sir Geoffrey Handley-Page!

7. Civil Airway emergency landing fields are located at intervals of 15 minutes flying time so that at no time is an airliner more than 7 or 8 minutes from safety!

8. On target gunnery maneuvers different planes have their machine gun bullets dipped in different-colored wet paint which leave a mark on the target sleeve so that individual scores can be credited!

9. The aluminum alloy Alclad sheet used on modern fighters and bombers is less than *one-tenth* of an *inch* thick!

10. Major-General Frank P. Lahm, who, as a young second lieutenant became the first Army officer to fly an airplane, was recently retired as commander of huge Randolph Field, Texas. After receiving a short course of instruction from Wilbur Wright more than thirty years ago, he received pilot license No. 1. Now 64 years old (official retirement age) Lahm was also the Army's first balloon pilot!

11. In terminal velocity dives of high speed military planes, wings do not pull or tear off, they twist off! As the dive progresses there is a download on the leading edge and an upload on the trailing edge built up which, if greater than the designed wing strength, twists it out by its roots!

12. The first enclosed cabin plane was a Bleriot design flown by Pilot Legagneaux in Frace in 1912!

13. A modern pursuit has 40,000 rivets; a bomber, 500,000 and the new superhemisphere bomber, 3,000,000! A modern double row radial engine has more than 8,000 individual parts!

14. The world's first aviation wind tunnel was designed and built by Dr. A. F. Zahm of Washington, D. C., in 1901! He measured its throat velocity by tossing small inflated balloons into the flow. He discovered skin friction and held the first Aeronautical Congress in Chicago in 1893, after inventing a three-way (aileron, rudder, elevator) control system in 1891!

15. The vacuum system of a modern combat plane sucks air from the rear of gyro instruments, passing through the pump, and goes into the de-icer system as air pressure!

16. James V. Martin, aviation pioneer, sued the entire aviation manufacturing industry for one billion dollars charging infringement of his original airplane patents. Litigation was in court for ten years and seven different decisions were handed down before Supreme Court finally rejected final appeal. Had he won, airplane costs would have doubled regardless of make or model due to the high license fees he demanded!

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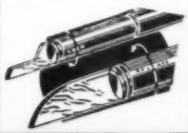

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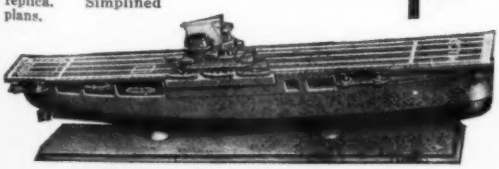

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